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EDITORIAL NOTES.

Proceedings in Committee on the Commercial and South Metropolitan Bills.

THE Commercial Gas Company's Bill came on Wednesday last before the Select Committee of the House of Commons presided over by Mr. E. Wason, and was disposed of by mid-day on Friday, on terms which are fully recorded in our "Parliamentary Intelligence." The settlement was, as is usual, a compromise arranged at "the psychological "moment" when the differences between the promoters and the sole opponent of the Bill—the London County Council—might possibly have descended into a conflict upon minor points that would have jeopardized the major interests which the Company were bound to regard. The objects of the Bill were, in the main, three. The first was stock consolidation and conversion upon the accepted model; and to this section of the proposals only a perfunctory opposition was offered on the part of the London County Council. The next was an increase of capital of £500,000; and the third was a reduction and a readjustment of the Company's standard price of 1875, coupled with a reduction of the statutory illuminating power of the gas from 16 to 14 candles. In the event, the Bill goes forward without further opposition with the first part unaltered; the money powers reduced to £400,000; and the standard price for 14-candle gas further reduced from 3s. 4d., which was the original proposal, to 3s. 3d. per 1000 cubic feet. The worst piece of mutilation submitted to was the deletion of the clause copied from the South Metropolitan Act of 1900, which specified the manner of testing the 14-candle gas by the use of the existing standard burner. This sacrifice was facilitated by the circumstance that the whole question of testing London gas was to be threshed out upon the Bill of the South Metropolitan Company, which immediately followed. It is a matter of detail, doubtless; but of great importance in the circumstances, as will duly appear.

The Commercial Company are to be congratulated upon having thus secured a resettlement of their affairs which thoroughly modernizes their constitution and powers, and gives them means and authority for the carrying out of the development of their business upon the most approved principles. It is a necessary consequence of the peculiar character of the gas supply arrangements of London that the three Companies which form the class of Metropolitan gas undertakings cannot be dissociated from one another whenever their affairs become the subject of public concern. Thus the Powers of Charge Committee, which was an outcome of the agitation of the Local Authorities north of the Thames against the comparative dearness of the gas supplied by the Gaslight and Coke Company, and reported with special reference to this subject of investigation, nevertheless formulated certain recommendations which were made to apply to all the Companies. There is a good deal to be said for the view that, but for the alleged shortcomings of the Gaslight and Coke Company, the inquiry by Sir James Rankin's Committee would never have taken place; and therefore the suggested revision of the standard prices of the other London Companies would never have been heard of. It, however, would be waste of time to discuss a hypothetical position that might have existed if something which was in fact done had been left undone. Sir James Rankin's Committee broke fresh ground; and every day that has elapsed since its findings were published, has strengthened the impression which those who were most competent to judge of such matters received from the first, as to the importance of the modification of the sliding-scale of initial price and dividend which those findings conveyed.

Mr. Livesey, with his usual acumen, first perceived how this cardinal recommendation of the Committee might be adapted to enable the South Metropolitan Company to emancipate themselves and their consumers from the unintelligent rigidity of the established system, which was bound to 16-candle gas. He struck his bargain while Sir James Rankin's counsels were yet echoing in the public ear. No time has really been lost by the Commercial Company in following his example; but already the way of deliverance has become a little clogged, as witness the shrinking of the Company from leaving it to this Committee to enact that what they call 14-candle gas is identical with the South Metropolitan commodity of the same name. The main point is, however, that the essence of the recommendation of Sir James Rankin's Committee with regard to the readjustment of the sliding-scale—corrected for reduced candle power—has once more been embodied in a Metropolitan Gas Bill.

Similar as the affairs of the London Gas Companies appear in the mass, there are yet specific differences between their circumstances to which those most nearly affected by them naturally attach the highest importance. Of these was the circumstance that, whereas the South Metropolitan standard price was 3s. 6d. per 1000 cubic feet before the Act of 1900, the Commercial standard price was 3s. 9d. On the present occasion, the petitioners very properly contended that this difference was a parliamentary mark of recognition of the existence of something positive and permanent in their conditions of working, which places them at a disadvantage of 3d. per 1000 cubic feet in the matter of price compared with the South Metropolitan Company. Unfortunately for the promoters, the Committee all along betrayed marked disinclination to accept this rendering of the facts. They appeared to prefer the view that the obtaining of so high a standard price was a lucky piece of business for the Company, which has paid them very well indeed for the last quarter-of-a-century. This disposition of the Committee appeared very plainly in connection with the constant reference that was made to the tables put in to explain the effect upon dividend of various possible alterations of the standard and selling prices of gas. In the event, as already mentioned, the promoters offered to take off another penny, in order to make it quite plain that they did not desire to gain any advantage in dividend from the change of statutory illuminating power. This concession seemed satisfactory to everybody. It leaves an inequality of standard price between the Commercial and the South Metropolitan Companies of 2d. per 1000 cubic feet—the standard price of the South Metropolitan for 14-candle gas being 3s. 1d., whereas that of the Commercial is now to be 3s. 3d.; but this is probably fairer than the original difference.

Immediately the Commercial Bill was cleared out of the way, the case for the South Metropolitan Bill was begun. The objects of this measure are also threefold; but in only one respect does it resemble, or coincide with, the previous Bill, and that is inferentially, in its proposal to abolish the London Gas Referees. The first object of the Bill is to secure powers to purchase compulsorily enough land adjoining the present East Greenwich works of the Company to practically double their ultimate maximum output. The case for this part of the Bill is that the land will probably be wanted in twenty years, if not sooner; and, failing this site, there will be nothing available nearer than Erith. For the time being, the cost of the purchase will be an unproductive burden upon the Company; but public solicitude on this score may be allayed by the intimation that the estimated charge is only about one tenth of a penny per 1000 cubic feet sold, which is a modest rate of insurance for having new gas-works when they shall be wanted. The awkward part of the business is that an important firm of steel and iron girder manufacturers for the building trade have planted their works on a portion of the site, and their interest in it consequently clashes with that of the Gas Company. As to the proposed disestablishment (with compensation) of the present Gas Referees, so far as the South Metropolitan testing is concerned, all we can say for the present is that Mr. Livesey's evidence on the point is of a piquant character, and will well repay perusal. The third and last proposal of the Bill is to increase the remuneration of the Board of Directors; and it is probable that, when he comes to deal with this topic, Mr. Livesey may add something interesting to the remarks he offered on the subject of the administration of gas companies at the recent meeting of the South Metropolitan proprietary,

Unchallenged Reduction of Illuminating Power.

THERE was one feature of the Committee proceedings on the Commercial Gas Bill, dealt with generally in another paragraph, which calls for distinctive mention here, inasmuch as it is of more than local and special importance. This is the impressive fact that the proposed reduction (from 16 to 14 candles) of the statutory illuminating power of the gas to be supplied to that part of London served by the Commercial Company, was not resisted by the London County Council, who were the sole opponents of the Bill. It is impossible to exaggerate the significance of this tacit acceptance, within two years, of a technical development which was strenuously opposed in the first case, in the imagined interest of the public, by the same body. Obviously, the case for the change of system in gas supply was so overwhelmingly made out in 1900 that there is no life left in the older order of things photometrical. But to yield the point without a conflict, as the London County Council did last week, is really a noteworthy admission of its force. Once more, it might be urged, the obstructive powers of officialism and vested interests have failed to stop the march of a simple truth. But we would rather lay stress and felicitate the London County Council and their advisers on their ready and even graceful conversion to the true faith in matters of cheap gas supply.

The little question that has sprung up incidentally as to what is 14-candle gas, will not long block the way of progress. The correct view of this question is that it is almost an idle one. When the technical world now pronounces for 14-candle power gas, it is, as Mr. Livesey makes haste to explain, merely because there is nothing better—that is, cheaper—in sight. If we knew how to make anything cheaper of the same kind, were it 10-candle, or 8-candle gas, according to the experimental determination of the photometrist, that is what we should recommend. This is what the typical photometrist as gas examiner somehow fails to grasp. There is no reason why a Gas Examiner, or even a Gas Referee, should be a photometrist and nothing more. So long as photometry corresponded fairly with the ordinary use of gas for lighting, the photometrist was in his proper element. What he called 16 or 14 candle gas was what the consumer might, if he were very careful, find of this illuminating value for the ordinary uses of artificial light. But the world has passed by all this, and left the photometrist in his lonely testing-station, "a pagan suckled in a creed out-"worn." The great working world no longer cares a snap of its busy fingers for his refinements of testing, translateable possibly in the second place of decimals of a candle power. The world wants to know what its gas is good for; and the official examiner does not appear to know. How is the user of gas for power to be assured that he gets his money's worth? How is the consumer of gas for cooking and heating to be satisfied that he is being properly served? It has been said that already one-half of the gas sold in the summer season in English towns is used for purposes other than lighting. Properly speaking, this gas is not tested at all; but when the official view is properly focussed on the question, something will probably be done in this sense.

The Training of the Junior Gas Engineer.

IT was with not a little gratification that we recorded in the last number of the "JOURNAL" the action taken by the Honorary Secretaries of the Manchester and District Junior Gas Association in drawing the attention of the members of that body to the article in our issue for the 18th ult., on "The Sons of Engineering and of the Gas Industry," with the view of eliciting opinion as to the advisability of the Association taking up the matter dealt with therein, in conjunction with the senior Associations. It was the intention to discuss, at the meeting last Saturday, various subjects of interest to the gas industry; but, as will be seen by the report which appears elsewhere, the article referred to was considered of sufficient importance to justify the devotion of the entire sitting to it. The question of education, as is well known, is by no means new to our columns; and it was only the work which was being done by the Institution of Mechanical Engineers for their juniors that evoked the observations which have set in motion the youngest of the Associations connected with the gas industry, with the object of seeing if something cannot be done for the class represented therein. Our readers are acquainted with what the Institution just named and the Institution of Civil Engineers are doing; and we have directed attention from time to time to the educational scheme of the American Gaslight Association. In another profession—architecture—a systematic course of study is provided by the Architectural Association for the benefit of those desirous of qualifying themselves for entrance into the Royal Institution of British Architects, and thereby acquiring the higher status which membership of that body gives.

In face of this, we ask again: What work on similar lines are the Gas Institutions doing? We will leave them to answer. As we said before, they may not have the power of the two great Institutions whose example we were citing in the article in question; but they can do something for the young men of the industry. The Lexicographer whose spirit may be hovering about the precincts of the "JOURNAL" office said many wise, and possibly some foolish, things in his day; but he is reported to have enunciated one wish, in which most of us will go heartily with him—viz., to "have "every man master of his business." How is the junior to acquire that mastery except by being able to profit by the wisdom, experience, and general bearing of his seniors? This he can best do by association with them. The life of the professional man is divided into three epochs. In the first he is a learner, in the second a practitioner, and in the third a teacher. Surely a body of such teachers is not an impossibility. We sincerely hope the movement again set on foot for ensuring that the successors of those who now occupy conspicuous positions in the gas industry shall be thoroughly qualified to fill them, may not be allowed to quiet down into inaction. Any help we can render in keeping it alive will be the more cheerfully accorded from the profound conviction we have always had that the efficient training of the junior gas engineer is at the very root of the prosperity of the gas industry in the future.

The Competition of the Oil-Lamp.

IN all the literature of the gas industry during the recent years of the competitors of gas, electricity has monopolized attention, and little notice has been bestowed upon the competition of the oil-lamp. The rivalry of this means of artificial illumination is mighty in its extent; and its neglect by the gas profession, at its conferences and in its press, is, when one comes to think over the subject, rather surprising. This may be explained by the fact that, unlike the newer opponent, its competition is hidden rather than open—it is not exposed to the public view in the same way that electricity is; and moreover it has practically always been with us. But says the gas manager: "We are waging war "against this ambushed opponent by means of our prepay-"ment meter system." True, and with very creditable effect. But our point is that no really good and authentic information has been published by a member, or on behalf, of the gas industry to show the greatness of the superiority of gas lighting over the oil-lamp, more especially since the advent of the incandescent mantle. There are signs that there is to be a little more life and activity infused into the competition from the side of the oil-lamp; and if, as is suggested, a standard is adopted to which oil-lamp manufacturers shall work, there will no doubt follow a renewal of confidence and appreciation which may for a time partly check the rapidity of the progress of the prepayment gas system. If we are right in our reading of the signs, then it behoves gas managers to be up and doing; and to publish the best information to be secured as the actual relative positions of the two illuminants.

It is, on this ground, a pleasure to be in a position to direct attention to the lecture delivered by Professor Vivian B. Lewes, on Monday last week, in which he made some comparisons between gas and oil lighting, the like of which we do not remember having seen hitherto (see p. 697.). The portions of the lecture in which the comparisons are made are reported *in extenso*, as they form good and entertaining reading, and from them the gas manager will be able to extract some excellent serviceable facts. During the reign of the old flat-flame burner, neither in efficiency nor in economy had gas much to boast of in comparison with the oil-lamp; but the advent of the incandescent gas-burner has vastly altered their relative positions. Look at Professor Lewes's figures, and see what the oil-lamp and the incandescent gas-light can do for a penny; and then, our advice is, go and make the most of this authoritative statement. In the matter of efficiency and cost, it will be seen that gas has left the oil-lamp a distance in the rear. The latter has a very considerable leeway to make up; but inventors are heading towards the

adapting of the mantle to the incandescing influence of the oil-flame. Then in the matter of atmospherical pollution, the greater degree of offence attributed to gas in comparison with oil-lamps is more imaginary than real. If oil-lamps of a number sufficient to equal any given illuminating power obtained by gas-lights were placed in a room, it is clear from the lecture that the former would not have anything to triumph about. In the matter of the emission of carbon di-oxide, the oil-lamp is really the greater evil offender; but it is in the throwing off of water vapour that gas transgresses the laws of comfort. The rapid saturation of the atmosphere with the water vapour causes a check to one of the functions of the bodies of the occupants of the room, and produces that oppresive feeling of which frequent complaint is heard. The lesson we read from the lecture is that, with adequate ventilation, the oil-lamp is entirely out of the running with the modern method of gas illumination. The points of Professor Lewes's lecture in which this is shown will come in handy as weapons for the gas manager in the strife for custom.

A Rumoured Welsbach Compromise.

In the important affairs of life, it is so frequently the unexpected that happens. Just as it was thought we had within vision the long-awaited views of the High Court of Justice on the contentious point as to whether or not the Welsbach 1893 patent is a valid one, there comes a report of an unlooked-for turn in the matter. This says that there is a prospect of a mutual engagement being concluded between the Welsbach Company and the various parties, to end the litigation in a manner which will not injure any one of them, but which will benefit the gas industry and gas consumers. An indication of what may happen came to our knowledge before last Friday, on which day Mr. George Livesey hinted to the Commons Committee who were considering the South Metropolitan Gas Bill that there was something of the kind "in the wind." According to our report, Mr. Livesey said "in England they were very near "to obtaining a cheap mantle. He had been in negotiation "with the people who supplied mantles; and he thought "they would very soon come to an arrangement which "would be satisfactory. A very friendly spirit was being "shown; and he had almost come to an agreement whereby "cheap mantles would be obtainable." This, although it says nothing very precise, seems to be (in view of Mr. Livesey's recent activity in connection with this mantle question) a part confirmation of the rumour that very soon something will be heard of a compromise between the litigants. While mentioning this matter, it may be stated that Mr. Weir was unsuccessful in the House of Commons last Thursday, in getting the Attorney-General to grant a return of the mass of Welsbach litigation which has helped to swell the work of the Law Courts during the past decade; the reason for the refusal being that the suggested return related to private litigation.

Welsbach Prices.

Confirmation, to an extent, of the foregoing statements is afforded by a paragraph appearing in the "City Notes" of the "Pall Mall Gazette" yesterday. Our contemporary says that the advent of the new Directors of the Welsbach Company promises to be marked by a prompt and sweeping reduction in the prices of mantles and burners. At present a complete burner and mantle cannot be bought under 2s. 6d., and the form most generally used (as being the most convenient) costs 3s. 6d.; and they are now reliably informed that before long burners will be on the market at 1s., and mantles at something like 3d. each. Then a further change in policy is said to be promised. Hitherto the Welsbach mantles have been sold with the restriction that they are to be used only on Welsbach burners. It is now stated that this restriction will be removed, and users of Welsbach mantles allowed to use them on any burner they care to employ. This seems to indicate that the new Directors have determined to make a bid for public support by offering their burners and mantles at commercial prices; and it is "quite on the cards that the long-delayed trial of the patent "actions will never come to a hearing." Whether the fact that the gas companies, on the initiative of Mr. George Livesey, have recently begun a guarantee fund to provide a proper defence to the actions has had anything to do with this the "Pall Mall Gazette" is not certain; but they say it looks as if it had.

Preparing for the Gas Institute Meeting.

Although it may seem a "far cry" to June, the dozen weeks which intervene between to-day and the 10th of that month are none too many for carrying out the arrangements connected with the forthcoming annual meeting of the Gas Institute, which will open on that day at the Royal Victoria Rooms, Southampton, under the presidency of Mr. S. W. Durkin, Engineer and Manager of the Southampton Gas Company, where they will be accorded an official welcome by his Worship the Mayor (Mr. F. A. Dunsford, J.P.). The Secretary of the Institute—Mr. Walter T. Dunn—has therefore been well advised to remind the members of the fact, in order that those who are desirous of reading papers on the occasion may send early advice to him of their intention, and have sufficient time to prepare their communications. In regard to these, however, Mr. Dunn points out that it is not essential they should be lengthy. No member need be deterred from contributing to the proceedings because he is unable to produce a bulky paper, bristling with tables and diagrams. Many of the communications submitted to the Société Technique are quite short, yet possess points of interest. Consequently, Mr. Dunn suggests that brief descriptions of experiments or special plant, and notes of experience under exceptional circumstances, provide useful discussable matter, and are valuable for subsequent reference when recorded in the "Transac-"tions." Apart from the educational value attaching to the preparation of a paper, there is the chance of the more tangible reward in the shape of one of the Institute's prizes. With reference to the important question which is probably uppermost in the minds of the members in connection with the next meeting—the proposal for amalgamation with the Institution—a report upon the negotiations which have been in progress between the Councils of the two bodies since the last annual gathering will be submitted. As usual, the business meeting will be followed by an excursion. Mr. Dunn closes his circular by urging the claims of the Benevolent Fund of the Institute to the attention of those members who have not yet fully recognized them by enrolling their names as subscribers.

Gas Topics at Sheffield.

Sir Frederick Mappin had several interesting subjects on which to discourse at last week's meeting of the Gas Company over which he so ably presides. First of all, he had to report that the working of the past six months had been, on the whole, successful. In spite of a reduction in price last October, of 2d. per 1000 cubic feet, the receipts from the sale of gas were only slightly less than in the corresponding half of the previous year—thus proving (if any such proof were necessary) the wisdom of this step. In Sheffield, as elsewhere, the use of incandescent gas-burners is rapidly extending; while at the same time the electric light consumers are complaining bitterly about the abnormal rise in their bills that has taken place since the increased voltage was adopted. The heavy accounts rendered to the citizens for electric current furnish the Gas Company with an opportunity of which we may be sure they will take full advantage. Here there are no bewildering theories or questions of candle-power-hours to be twisted and turned about so as to form "comparisons." Seemingly these have, in Sheffield, resolved themselves into one plain, but most obtrusive, fact; and this fact is that it costs a man vastly more to light his house or shop by electricity than it did when he used gas for the purpose. Not a very formidable antagonist is electricity under these circumstances, for such an enterprising undertaking as the Sheffield Gas Company!

Two Good Advertisements.

Complaints in Sheffield are not, however, altogether confined to the electric light; the quality of the gas has also been called in question. Among other things, it has been accused of damaging the wall-papers and blackening the ceilings in the course of a few months. Sir Frederick says that Sheffield gas does not do these things; and, as proof of his assertion, he brings forward the fact that his house was decorated forty-four years ago, and the ceilings and walls have been cleaned once since, though gas has been burning every night when his family have been at home. A more favourable testimony than this to the cleanliness of incandescent gas lighting, it would be impossible to conceive. But, at the same time, we cannot help feeling some pity for the house-decorators, whose trade, it thus seems, will be

knocked to little bits by the general adoption of this form of illumination. Besides the Chairman's personal evidence with regard to the cleanliness of gas for lighting, the Directors of the Company are doing something to assist its use for power purposes; they having decided to offer to the Sheffield Technical School a Westinghouse three-cylinder gas-engine, so that the 700 or 800 students may become familiar with the advantages attending their use. The Company will doubtless derive considerable benefit from their far-sighted policy in this respect; for, in a manufacturing place like Sheffield, there must be almost unlimited scope for the use of gas as a motive power. Already there are nearly 800 gas-engines fixed; and the quantity of gas supplied to them last year was 189 million cubic feet.

Company and Corporation Management.

Referring to statements that Sheffield has suffered by not taking over the gas-works years ago, Sir Frederick said the consumers ought to be thankful that they did not purchase the undertaking; and to make good this assertion, he instanced the cases of Manchester and Nottingham. In the former of these places the price of gas is 9d., and in the latter 10d., more than it is at Sheffield. The Manchester undertaking pays £52,000 and the Nottingham one £24,000 a year in aid of the rates; while Sheffield, if charging the same prices, could, after paying a dividend of 10 per cent. to the shareholders, hand over for this purpose £102,000 and £114,000 a year respectively. Whatever facts there may be to account for these great differences, it is clear that the consumers have lost nothing by the gas-works remaining in the hands of the Company, though the mouths of the ratepayers who do not use gas will probably water at the thought of the big sums that might, by the municipalization of the undertaking and the raising of the price of gas to the figure charged by Manchester or Nottingham, find their way into the coffers of the city. All the benefits of the present excellent management of the concern are enjoyed by the consumers in the very low price charged for gas; and if the works were taken over by the Corporation, they could not possibly be better off, while, on the other hand, they might fare a great deal worse.

The Inclined Retort Controversy.

In our "Correspondence" columns to-day, there appears a letter from Mr. Drory, which we are sure all those interested in the question of Inclined *v.* Horizontal Retorts will read carefully, in connection with the particulars with which this gentleman has already favoured us. Mr. Drory deals more especially with Mr. Alexander Wilson's criticism of his statements which appeared in our issue for the 4th inst.; and he points out a very important fact which he thinks Mr. Wilson lost sight of in his calculations—namely, that 87 per cent. more retorts are required in his case to carbonize the same quantity of coal as the 46 settings of inclines with 414 retorts at the Mariendorf works. Be this as it may, we shall be pleased to see two such doughty champions fight their battle to a finish, for which purpose they will both (as well as any others joining in the fray) receive a hearty welcome in our pages.

The Report on Acetylene Generators.

In another column we give the substance of the Home Office report on acetylene generators. Not a very great deal has been heard of acetylene lighting recently, though there is unquestionably a large trade in it for special purposes. It is so far satisfactory to learn that the investigation resulted in showing that the acetylene generators submitted for examination resembled the proverbial Scotchman's idea of whisky—none was bad, but some were better than others. As in the early days of gas lighting, the chief trouble of the manufacturers lay in the inoffensive disposal of the residue of the wet-lime purification, so the getting rid of carbide of calcium "sludge" is now one of the main objections to the extensive working of acetylene generators. As was to have been expected, the Committee do not warmly approve of the automatic style of acetylene generator, and think that many of these devices, made to sell, are unnecessarily and undesirably complicated, while others are dangerously light and flimsy. The most valuable outcome of the investigation has been the compilation of a useful set of rules for generator construction, which cannot fail to guide the authorities responsible for seeing that the use of acetylene for lighting is made as safe as possible. We note with some surprise that no limit of size has been suggested for acetylene generators. One would naturally think that apparatus which might be quite unobjectionable if limited to the treatment of a few pounds of carbide per hour would be dangerous if unduly magnified.

Gas Supply in Germany.

From the report and balance-sheet for 1901 of the German Continental Gas Company, which have just come to hand, it appears that the rapid growth in the business which has of late years been experienced has received a slight check during the twelve months just closed. Besides the high price that has had to be paid for coal, it was hardly to be expected that the Company could escape altogether from the effects of the severe industrial depression which has swept over Germany. But in spite of all this, the net profits for 1901 are only some £7670 less than in the preceding year. There has been no falling off in the consumption of gas, but, on the contrary, a fair increase, though not such a large one as the Company have of recent years become accustomed to. It would not, under the circumstances, have been surprising to find an absolute decrease in the quantity of gas sold; and the results attained must be regarded as satisfactory, though the dividend of 12 per cent. compares with one of 14 per cent. for the previous year. Of course, as the proportion of the output of a gas company which is used for power purposes increases, the profits of the company must become more and more dependent upon the condition of trade for the time being; and this is a point which must not be lost sight of in connection with the growing use of gas-engines. Industrial depression cannot affect the consumption of gas for lighting to anything like the extent that it will the quantity utilized for motive power.

The Malvern Gas-Cooker.

We note with some interest that the Malvern gas-cooker case has reached another step in its career. It will be remembered that last month the Magistrates, after at first declining to grant a summons to recover an amount due for the hire of a gas-cooker, subsequently consented to do so. When last week the summons came before them for hearing, Counsel for the defendant argued that a gas-cooker was not a gas-fitting, and that consequently the Court had no jurisdiction. But the Magistrates, who had presumably meanwhile learnt of the judgment in the case of *Gaslight and Coke Company v. Hardy* (which, though it had reference to a gas heating-stove, was subsequently held to cover gas-cookers also), ruled that they had jurisdiction. Thereupon Counsel asked for a case to be stated; and this was agreed to. The amount involved for the hire of the cooker (and which is apparently to be the subject of an argument before the High Court) is 2s. 6d.! Evidently there are some people who find a pleasure in going to law.

WATER AFFAIRS.

Progress with the Government Bill.

THE opinion held in political circles, to which reference was made last week, that the Government are determined to persevere with their Water Bill, whatever other modification may have to be made in their legislative programme during the session, was probably founded upon the remarks made by the President of the Local Government Board when moving that the Bill should be referred to a Joint Committee of the two Houses. His proposal was characterized as unconstitutional, and as an attempt to do away with the check afforded by a separate inquiry by each House. But the objections were demolished by his powerful arguments in support of the course he advised the House to take. He explained that the two considerations which had been foremost in the mind of the Government had been economy of time and saving of money. If the Bill had to go through the ordinary stages, he did not think it would be possible for it to do so within the compass of an ordinary session. Moreover, the cost would be practically doubled. As to his motion being unconstitutional, he assured the House that the ordinary procedure would be followed, and that, as the Bill affected private property, the owners concerned would have the privilege of presenting their case to the Committee through counsel, and also supporting it by evidence. The

Speaker added his testimony to the correctness of the course proposed; and, as mentioned last week, it was eventually sanctioned.

But subsequently some doubt seems to have arisen as to the power of the members of the Upper House to join in the inquiry until the Bill itself had been formally submitted to them. In order to overcome this difficulty, Lord James of Hereford, as will be seen from our "Parliamentary "Intelligence," introduced the Bill into the House of Lords on Monday evening of last week, and it was read the first time—the second reading being taken on Thursday. This procedure was criticized by Lord Tweedmouth, who said he believed the House had power to join a Committee of the other Chamber without the preliminary introduction of a Bill. The Earl of Morley, however, enlightened him on this point; and, after a few remarks from Lord Salisbury, expressing the hope that the inquiry would be an impartial one, and be carried out with the single object of the public interest in view, the Bill was read a second time, and their Lordships resolved to concur in the proposal for the Joint Committee. In the House of Commons yesterday, Mr. Long took a further step in the direction of securing the passing of his Bill by moving its reference to a Committee of five (to be nominated by the Committee of Selection), who, in conjunction with the Lords' Committee, will consider all petitions presented before the 25th inst.

Further objections have been raised to the constitution of the proposed Water Board. The District Councils of Acton and Chiswick and the Borough Council of Ealing have all expressed dissatisfaction with the extent of their representation; and it is understood that Mr. Long will amend the Bill so as to increase it. Authorities in the Thames Valley are also moving. At an important conference of County and County Borough Councils interested in the London Water Bill recently held at Reading, it was strongly urged that there should be upon the Board some representation of the watershed area of the Upper Thames, which has been placed under the most stringent regulations for ensuring the river and its tributaries against pollution, if only to furnish information as to what has been and is still being done in the direction of keeping the streams pure. It was pointed out that the service of the Upper Thames navigation is almost entirely carried out by contributions imposed by Parliament upon the Water Companies; and though the obligation to make these payments is to be transferred to the new Board, it is possible that objections may be raised thereto by certain members, who would suggest, as the County Council had done, that the service of the higher portions of the river should be provided by a rate on the riparian districts. For these and other reasons, it was considered necessary that the localities concerned should have some representation, however small, upon the Board. The members attending the conference were all of them agreed upon the general principle; but opinions were divided as to whether what was desired could be best obtained by means of additional members from the Thames Conservancy, or by direct representation from the various Councils in the area of the Upper River. Lord Llandaff's Commission gave the Conservancy Boards of the Thames and Lea one-fifth of the representation on their Board of thirty; whereas the Government Bill proposes to allow these bodies to send only two members out of 67. After a full discussion of the matter, a resolution was passed in support of direct representation.

We learn from "La Vie Scientifique" that an important decree has just been formulated by the State Council of Paris, which is of great interest to French gas and electric light companies. According to this decree, a gas company possessing the privilege of supplying light can claim to include in that term electric light, on conditions which would be accepted by a third party.

The many methods which, during recent years, have been tried for converting peat into a transportable fuel by stacking, or heating it in open or closed vessels or retorts, have proved failures. A new way, however, seems to show better results. In this case, the peat is compressed at a temperature of 400 or 500° C. by hydraulic power, and most of the water being driven out by the heat, tar products are formed similar to those which arise when peat is carbonized, but the escape of which is prevented through the high pressure. The quantity of carbon is thus increased, while the water and ashes become considerably reduced. The briquettes obtained are solid and heavy, and give from 70 to 80 per cent. of carbon and combustible gases. The heating power of these peat briquettes is said to be very high, their calorific value reaching nearly 3000 calories per pound.

ESSAYS AND REVIEWS.

REPORT OF THE COMMITTEE ON ACETYLENE GENERATORS.

Our readers may remember that, in view of the extended use of acetylene, and of the possible dangers attending the generation of this gas in certain forms of apparatus, the Chief Inspector of Explosives (Captain J. H. Thomson) considered it advisable that the Home Office should have the advantage of expert advice upon the subject. He therefore took steps to form a Committee to advise him in the matter, and carry out such tests as might be necessary for the purpose. Communications were addressed to the following gentlemen on Dec. 22, 1900, and they willingly consented to act: Mr. C. Vernon Boys, F.R.S., one of the Metropolitan Gas Referees; Mr. H. E. Jones, M.Inst.C.E., Engineer and Manager of the Commercial Gas Company; Professor Vivian B. Lewes, F.I.C., F.C.S,, Gas Examiner to the Corporation of London; Dr. Boverton Redwood, F.R.S.E., F.I.C., Adviser on Petroleum to the Home Office; Mr. Alfred Spencer, Chief Officer of the Public Control Department of the London County Council; and Mr. James Swinburne, M.Inst.C.E. These gentlemen were constituted the Committee, with Captain M. B. Lloyd, one of the Inspectors of Explosives, as Secretary. It appears from their report, which has just been issued, that they did not lose any time in getting to work. On Jan. 7, 1901, they issued a circular to the members of the trade, inviting them to submit the apparatus manufactured by them to the necessary tests. In response thereto, they received a larger number of applications than they anticipated; and they tested what they consider may be regarded as nearly the whole of the various types of generators in use in the United Kingdom.

The Committee laid down the conditions which, in their opinion, a generator should fulfil before it can be considered as being safe; and they kept them steadily in view in carrying on their work. They tested 46 different generators; and the results are set forth in an appendix to their report. In every case a representative of the firm who submitted the apparatus was present, so as to ensure the generator being worked under the most favourable conditions. The actual testing was carried out by Mr. W. W. Duffield, F.C.S., under the direction, and as far as possible personal supervision, of the Committee; and they place on record their satisfaction with the manner in which the tests were carried out by him, and thank him for the very able assistance he rendered throughout the inquiry. His results are tabulated, and show at a glance the names of the apparatus and the parties submitting it, whether or not it is automatic, the source of the carbide used, the quantity of gas made per pound, the percentage of the possible yield, and the pressure in the generating chamber and other parts of the apparatus.

The terms of reference did not distinctly specify that they were to examine into the efficiency of the generators submitted for test; but they considered that, though a high yield of gas per pound of carbide does not necessarily imply safety, yet, on the other hand, a low yield of gas from high-class carbide is objectionable, as all the gas capable of being yielded by the carbide must be generated at some time or other, and if not delivered by the apparatus to the service-pipes may subsequently cause a danger or a nuisance.

It is pointed out in the report that with all generators the ultimate disposal of the lime sludge, and the water saturated with acetylene, is a point of considerable importance; as though the discharge of a small quantity of such residue into the drains would probably not cause any trouble, yet, in the extended use of acetylene, the escape of gas from quantities of saturated water, or from incompletely decomposed carbide, might lead to explosion or nuisance, and the presence of a large bulk of lime in the drains might cause such precipitation as would silt up traps, &c. In districts where sewers exist, the objections could, they say, be met by leading the effluents from generators into open catch-pits or intercepting chambers, from which the overflow only is discharged into the drains. Where cesspools are the only system of drainage, great advantage accrues from the discharge of the lime sludge directly into the cesspool.

A large proportion of the generators examined belonged to the automatic class. In these the object is the gradual generation of the gas as used; whereas in the non-automatic types the whole of the gas which can be generated from a given charge of carbide is evolved in a short time, and a gasholder has to be provided large enough to contain it. The contention is that the generation of the gas as used, and the absence of a large holder, are advantageous or convenient. The Committee acknowledge that when all goes well this may be so; inasmuch as, under the skilled supervision and favourable conditions of the tests made by them, serious difficulties did not arise, and, in general, the apparatus worked well. They are not satisfied, however, that under the varied conditions of use, especially with unskilled labour, this would always be the case; and they do not think the advantages aimed at by the designers of automatic apparatus are sufficient to make it worth while to incur the possible trouble which may be met with in the practical use of automatic generators, especially those of complicated design. At the same time they are of opinion that, in certain circumstances, with due safeguards, the employment of

automatic generators may be admittedly convenient. In closing their report, the Committee think it right to point out that, while the generators did not in any instance show evidence of being otherwise than safe under the conditions of the test to which they were subjected, many were, in their opinion, of unnecessarily and undesirably complicated design, and some were not sufficiently strong in construction. On the whole, having regard to the conditions of use which must often prevail, they consider that, in the selection of an acetylene generator, regard should be had to the following desiderata: (1) Simplicity of action and design; (2) strength of construction; (3) high efficiency, as indicated by the yield of gas per pound of carbide; (4) low pressure in the generator; and (5) facility of removal of the residue.

The report of the Committee is preceded by one by Captain Thomson, in which he expresses satisfaction at learning that, out of the large number of generators tested, not one showed evidence of being otherwise than safe under the conditions of the test. He does not, however, consider that this demonstrates that the uneasiness of the Department in regard to possible danger was uncalled for, inasmuch as he has reason to believe that more than one apparatus was withheld from being tested owing to knowledge of the fact that it would inevitably give a bad result. Moreover, in one or two instances serious defects in design were remedied before a generator was submitted to the test. From the numerous references and appeals which are addressed to the Home Office, Captain Thomson thinks it is evident that the conditions of safety are but little understood, not only in regard to the construction of generators, but also to the storage of carbide of calcium. The former are fully dealt with in the report of the Committee, which is followed by an illustrated description of all the generators tested, most of which have been noticed in our "Register of Patents" or elsewhere; but the Chief Inspector deems it advisable to append a form of licence embodying the precautions which are desirable when carbide of calcium is kept for sale, and a second form suitable for cases in which it is stored for use in generating acetylene on the premises. These forms, which are merely suggested for the assistance of local authorities, and are in no way binding, are based upon those in use by the London County Council, as well as on licences granted by the Home Department on appeal.

STATE OF THE AMERICAN IRON MARKET.

Those whose business it is to watch carefully the trend of the iron and coal markets, would do well at present to keep an eye on the course of events in the United States, where, as pointed out last week, the position in the iron and steel trades is somewhat remarkable. The output of the pig-iron furnaces is unprecedentedly large—being at a rate equal to about 16 million tons per annum, or more than twice the total production in this country. Yet it is by no means equal to the current demand. This is due, apparently, to the enormously increased use of steel for structural purposes—almost all large buildings erected of late years having steel as the principal material in their construction—and to the rapidly extending use of steel cars on railways. The result is that prices are all on the up-grade, and are at the present time appreciably higher than at this time last year; the average quotations for iron and steel in the States being about 20 per cent. above those for March, 1901. Steel-making plants have been, and are being, erected which will require a supply of raw material—that is, iron—for providing which no adequate addition has been made to the iron-making plants; and the natural result is an undoubted scarcity of both iron and steel. The exact position of affairs can best be studied in the very full "American Letter" published in the current issue of "The Iron and Coal Trades Review;" and that column should not be overlooked week by week by those desirous of forming an accurate estimate of all the factors governing the course of our own markets. America's output and consumption of iron are now on such a vast scale that a material difference, one way or the other, between the two is bound to have a tangible effect upon the markets of the Old World.

For the present, the balance is against the output, and appears likely to be so in the immediate future. The correspondent to whose letter we have made reference states that there are now under construction a great many open-hearth steel furnaces, and that it is a question whether they will be able to secure enough pig iron. There is a well-defined scarcity of scrap iron, of which steel makers use a large quantity; while "finishing mills are scouring the country in the effort to get steel." Moreover, the shortage of steel is not only in regard to prompt orders, but extends to requirements for the current year. The mills are, many of them, running short time, with their order-books full, and customers pressing for delivery; and the cause is lack of steel. The great Steel Trust itself is in the same position, not being able to produce enough raw material to keep its mills going.

The maintenance of the very flourishing condition of the iron and steel trades across the water, which has lasted for several years, and forms a considerable contrast to the slackness here and on the Continent, has been rendered possible by the wisdom of the big producers in restraining, as far as they were able, the tendency of prices to rise. The Steel Trust especially has set its face against any such inflation of prices as took place during 1899-1900 in this country, well knowing the killing effect upon trade of these enhanced costs; and this policy of moderate prices has been greatly facilitated by the fact that, thanks to the use of coal-cutting machinery, the output of coal has, up to the present, kept pace with the growing demand, so that fuel prices have kept on a normal level.

What effect is the present condition of the American markets likely to have upon the price of iron and coal in this country? The answer to this is, of course, that it all depends upon what it is impossible at present to determine—namely, how long the condition is likely to last. If the demand for steel in the States continues to be greater than the supply of iron from which to make it, and those who require the steel are willing to pay for it at prices higher than those now current in their markets, the steel makers and finishers are certain to draw upon foreign sources of supply for part of the excess requirements. They have, in fact, begun to do so already, though not to any appreciable extent; but it is possible that considerable exports to the States may take place during the next few months. Should this be the case, Canada, Germany, and Belgium will be keen competitors with us for the orders; but as British steel is generally preferred to any other, we are likely to receive a good share of the trade.

This would mean that some of the numerous blast-furnaces now standing cold in this country would be blown-in again, seeing that we have no stocks of iron worth talking about—makers having naturally refused to store iron made with dear coke. This would give a decided fillip to the coke trade, and consequently to the coal market. The coal "famine" of 1873 was, it will be remembered, primarily caused by the great demand for iron from America; but that we are about to witness a repetition of this experience, we do not for a moment suggest or imagine. Indeed, the influence upon our markets of the great activity in the States may continue to be, what it has up to the present been, practically negligeable. We are merely now calling the attention of those concerned to the advisability of keeping an eye on the course of events on the other side of the Atlantic. The occasion is not one for anxiety, only for watchfulness.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 725.)

Business on the Stock Exchange last week was on a very limited scale; and the tone in every department was dull to a marked degree. The rout of Lord Methuen's force had a depressing effect at the opening, while the close was cast down by the critical condition of Mr. Rhodes. Prices throughout the list, from Consols down to the very speculative class, suffered to a more or less considerable extent; and it was only here and there that an advance could be detected in something specially affected by circumstances. The settlement proved an insurmountable difficulty for two or three operators. The Money Market was very firm—there being a strong demand for Stock Exchange and other purposes; and discount rates were steady. In the Gas Market, there was a considerable falling off in the volume of business done, and things are likely to continue at reduced pressure until we are through the Easter holidays. Movements in quotations also were not very numerous; and even of them the greater part were due to *ex div.* adjustments. The market seemed to partake of the depressed tone which ruled in the other departments generally; and there were rather more reductions than advances in price. But in neither direction were alterations of any magnitude. In Gaslight issues, the ordinary was moderately dealt in pretty well every day at very even figures, which never ranged outside the limits of 91¼ and 92¼; and it did not evince any disposition to improve. The secured issues were rather quiet, and prices were not very good; the debenture falling back a point. Business in South Metropolitan was light, and the tendency was weak; prices shrinking from 125 at the opening to 122½ at the close, with a fall of a point in the quotation. Commercials were quite untouched. In the Suburban and Provincial group, there was not much doing; and movements were very slight. Brighton and Hove original receded, but Brentford new advanced. In the Continental Companies, business was extremely limited. Imperial was inclined to be rather firmer, but Union fell back. There was nothing to call for special notice in regard to undertakings in the remoter world. In the Water department, the feeling was much brighter, and more buoyant; the prospects of the Companies in regard to the Government Bill being more hopefully looked at. Several of the quotations made larger or smaller improvements, ranging from 5 points in most cases to a maximum of 10 in West Middlesex.

The daily operations were: There was very little doing in Gas on the opening day, and quotations did not move. In Water, East London advanced 2½, and Grand Junction 1. On Tuesday, the volume of transactions was even lighter still. Continental Union receded 2. Wednesday was no better than a quiet day, and prices were not good. Brighton original fell 2. In Water, Chelsea and West Middlesex rose 5 each, and East London 2. Thursday's sum-total of business reached only a very moderate figure. Brentford new advanced 1. In Water, Lambeth and Southwark "D" improved 5 each, and East London 1. Friday was about as quiet as the rest of the week. Gaslight debenture receded 1. In Water, Southwark ordinary and West Middlesex rose 5 each, and Grand Junction 2. Saturday was quiet. South Metropolitan fell 1.

ELECTRIC LIGHTING MEMORANDA.

Corporation Gas and Electricity Supply—Example of West Bromwich—Misleading Comparisons—Eleemosynary Electricity.

It is sometimes rather amusing, and always instructive, when a lively local authority possesses and pushes both gas and electricity supplies. It is a common complaint of electricians that the same committee of a local authority ought not to have control of both undertakings, because in this case the members are more than likely to favour the one which brings in the larger revenue, which is never the case with electricity supply. Although there are examples in existence to disprove this cheap aspersion of the impartiality of mixed gas and electric lighting committees, it is doubtless more expedient, on all accounts, that the control of the two businesses should be kept separate. A spirit of healthy rivalry is thus fostered, which, if restrained within a reasonable tether, is good for the public. Sometimes, however, this rivalry is carried rather far, and then the spectacle of committees of the same authority engaged in running down one another's wares is apt to be more entertaining than edifying. Such appears to be the state of affairs at West Bromwich, where the Corporation electricity supply has a tough job to conquer business for itself in competition with the Corporation gas. The example is worthy of note, as a refutation of the suggestion, sometimes proffered, that there need be no actual competition between gas and electric lighting, seeing that each has its own proper field of usefulness, and so forth.

That plausible tale is a delusion prepared by the enemy for the more effectual lulling to sleep of already supine gas companies. It is true, of course, that there is scope in the same district, when it is of a certain class, for both gas and electric lighting; but that is only when the district is of a comparatively rich character. For example, when electric lighting was first introduced into the West-end of London, it was a considerable time before the Gas Company felt its pressure. This was because it was originally employed only for the lighting of the best rooms of the best houses—palaces, in fact, if not in name—whither gas had never penetrated. Electricity, in the West-end of London, displaced wax candles and colza oil lamps; and the Gas Company smiled over the circumstances. But afterwards its use spread; and the Gas Company smiled no more. In industrial districts, competition between electricity and gas is positive and unmasked from the first. Electricity is advertised and pushed in all fair—and some other—ways as an improvement on gas. There is no pretence as to there being room for both. The circular, whether emanating from the town hall or from a company's office, which sets forth the advantages of electricity, always places gas at a relative disadvantage.

When this is a corporation performance, and is aimed directly at another corporation affair, the antagonism becomes almost ludicrous. In the neighbourhood of West Bromwich, where men have the reputation of fighting, when they do fight, without gloves, the mutual acerbity of the gas and electric lighting interests is well marked, and the rivals do not stick at trifles in pushing business. Thus the Corporation, in the capacity of suppliers of electric light, offer to do all wiring and plain electric fitting at cost price, and spread the payments over a period of ten years, subject to 10 per cent. discount for cash payment during the first year. They never did this for gas. If they do prepayment gas-meter fitting now, it is on a small scale; but the Corporation quote for a private house fitting of thirty electric lights as an example of what they are willing to do in this line. Then, the Corporation go on to state that "no other form of artificial light is free from injurious products of combustion," which is as much as to say that their own gas is a deleterious illuminant. Not a very wise statement, one would think! But not content with taking away the character of their own gas, the Corporation attempt to show that they are prepared to undersell and supersede it. They offer electric power at an even rate of 1d. per unit, which is plainly under cost price. The charge for lighting current is 4½d. per unit for the first 91 hours of maximum demand per quarter, and 1½d. per unit for the remainder. Let us hope the public will understand it. In the endeavour to explain the system of charging, the Corporation circular not only sets out in tabular form what the electricity will cost, but how it would compare with gas giving the same amount of light.

It is unfairly done—we had almost said, "of course." In showing how the "rebate system" would work out over a quarter, in cases where the lamps are used 1, 2, 3, 4, or 5 hours per day, nothing is included for cost of lamp aging and renewals, which is a bad omission to start with. Next, gas is supposed to be burnt always by "5 cubic feet ordinary burners," yielding an illuminating effect liberally estimated at 2⅗ candle power per cubic foot. And naturally, no such trifles as the discount on the Corporation prices for gas are taken into the computation. It is a thousand pities that even corporation electricians should play the ostrich in this fashion, thrusting their heads into any hole rather than see an incandescent gas-burner. Obviously, it will be for the West Bromwich Corporation Gas Committee to take very good care that the incandescent gas-burner shall be kept in plain evidence, as they can easily do by availing themselves of the resources of civilization in this connection. It appears that the Corporation are fully prepared to lose heavily by their electricity supply, not only in the matter of power, but also in the lighting branch. It will only be necessary for a private consumer to use his lamps on an average three hours daily to have his bills made out at the price of 2½d. per unit, which, it is scarcely necessary to remark, cannot possibly pay.

THE COST OF ISOLATED ELECTRIC LIGHTING.

One of the most dangerous rivals of gas lighting is the "isolated," as it is technically termed—or as it might be called with equal truth and more exactitude, the private electric lighting plant—such as is not infrequently found at large "stores." These installations are even a greater annoyance to the central station electricity supply undertakings in their vicinity, by reason of the claim usually advanced on their behalf to superior economy. Unfortunately for the validity of this claim, correct and comprehensive accounts of the cost of working private electric lighting plants are extremely rare. Recently, a somewhat pretentious attempt to set out the economical aspect of such installations in America was made in the "Engineering Magazine;" but the result was not satisfactory. In commenting upon this essay, the "Electrical Review" remarked on the lack of any serious endeavour to place upon record the actual cost of private electric lighting since Mr. Gisbert Kapp's Society of Arts paper of 1893. It is significantly admitted, however, that Mr. Kapp's data probably still hold good, which does not argue for much improvement in electric lighting during the last decade. What gas has done meanwhile it is unnecessary to specify.

These comments of the "Electrical Review" brought out a communication from Mr. W. Newton Dumaresq, Chief Engineer to Messrs. Derry and Toms, of Kensington, where there has been in operation for the last three years a private electric lighting plant of considerable importance. This will be understood from Mr. Dumaresq's figures. The plant consists of three Babcock and Wilcox boilers, supplying steam to three Willans direct-coupled sets, and one horizontal engine driving a dynamo by a belt; total, 450 indicated horse power. The plant supplies current for lighting only. There is no storage battery. Three engines are run on the load; the fourth being kept as a stand-by. The plant runs on an average ten hours daily during nine months of the year, and fourteen hours per day throughout the winter—a load that any central station would envy. The accounts do not appear to have been brought down later than 1900; but the heads are as follows. Capacity of plant, 215 kilowatts; maximum load observed, 137 kilowatts; total electricity generated, 154,002 units. The working cost was made up thus:

	£	s.	d.		Per Unit.
Coal and other fuel	745	3	0	..	1·15d.
Oil, waste, water, and stores	199	2	3	..	0·41
General repairs and renewals	77	7	7	..	0·10
Wages chargeable to generating	376	14	6	..	0·58
Works costs*	1405	13	4	..	2·24d.
Depreciation	344	1	6	..	0 53
Rental value of engine and boiler house	115	0	0	..	0·11
Total	1864	14	10	..	2·88d.

Hereupon the observation is made that the "saving," in comparison with taking the supply from the Company's mains, at the price of 5d. per unit, amounted for the year to £1343 12s. 7d. It is, obviously, very much less.

In the first place, let it be admitted that an establishment which can find employment for an electric lighting plant of such magnitude, for such a long period of every day, is exceptionally well circumstanced for getting the supply at the lowest possible cost for working. It is difficult to value this advantage in money; but probably 1d. per unit would not be wide of the mark. That is to say, such an establishment might be expected to be able to generate its own electricity 1d. per unit cheaper than (say) a bank requiring the same sized plant. But for the rest of the comparison this factor can be left out of the account. What we have to deal with is the Resident Engineer's statement that the *total costs* of the electricity generated for Derry and Toms in 1900 amounted to £1846 14s. 10d., which worked out at 2·88d. per unit. This does not include interest on the prime cost of the plant, the amount of which is not stated. What would be a fair price for such an installation—£30 per kilowatt, machinery only, without land? This would make £6450, which is not far from the total indicated by the depreciation allowance, capitalized at 5 per cent. Let us call the amount £7000, for the sake of the round number. If the firm can borrow money at 4 per cent., this investment apparently costs them £280 a year for interest alone. In reality, it costs them more, because the firm are not in business merely to earn the bare interest on their working capital. Their total working capital must return considerably more than this, or it would be useless to carry on the business. Call it a 10 per cent. return, which is little enough. Besides, a commercial firm's borrowing powers are not unlimited; and every penny they put into an unrealized asset, such as electric lighting plant, is so much withdrawn from the trading account, which is another reason for charging it at the average trade profit. Therefore we must increase Mr. Dumaresq's total costs by at least £700 a year, cost of the capital involved. Well, now, what is the average cost

* We reproduce the table as it appears in Mr. Dumaresq's letter in the "Electrical Review;" but there are some slight errors, as the figures do not cast.

of Derry and Toms' business administration? If an article they deal in, or make, costs for materials and labour £1, what is the proportion they charge to it for general trade expenses before beginning to consider the question of profit? Probably from 35 to 40 per cent. of the first figure—materials and labour. If, therefore, the firm's electric lighting costs, for bare outgoings (including depreciation, which is prudent), £1864 a year, it will cost the firm somewhere about £700 a year to spend this and otherwise look after it. Grant that this allowance covers all the multitudinous items entered up under divers administration and management headings in the usual central station supply works accounts, we get as a truer, because more adequate, statement of the cost of this particular example of private lighting, £3264 a year, instead of £1864. Whereas the Engineer thinks he saved £1343 upon the equivalent lighting service as it would have been charged for by the public company, his employers were rather worse off by the transaction.

This is the correct way to value a home-made article, when it is manufactured in the ordinary way of business, and its cost is to be compared with a purchased equivalent. Of course the advantages of being able to supply oneself with electric light, or power gas, or well-water on the premises, are not all to be reduced to the money equivalent. There is a very great deal, sometimes, in having them independently of all exterior control or interference; but this boon must be paid for. On the other hand, there are conflicting considerations—as fire risks, noise, vibration, ground space required, ashes to be carted off, and so forth—which weigh down the balance in favour of the public supply. All these opposing considerations being duly weighed, it is possible—and only then—to form a just judgment as to how the contemplated service can be best provided. Reverting to Mr. Dumaresq's statement, it might be thought that the mere immensity of the apparent gain by the home-made article would have indicated the existence of something wrong with the basis of comparison. There are few commodities to be made at home nowadays at about one-half of the cost of the same article manufactured on the large scale elsewhere. There is very little "in it," as a rule, when one comes to look fairly into the difference between doing a thing at home, and putting it out. Neither electricity supply, nor gas companies, make dividends of 50 per cent. or thereabouts.

In the general interest of trade, and especially of the supply industries, it is desirable that consumers of an article should understand precisely what they are paying for when they buy it ready delivered for use. It would be wearisome, and should not be necessary, to repeat the catalogue of items that go to make up the price of such a commodity, but the disheartening fact is that people who ought to know better, and expect others to remember the truth in so far as it applies to their own business, constantly blunder when they go in for the same thing themselves. They often delude themselves with the thought that this or that working expense of making their fancied extra article need not be counted in. Error! Unless it can be demonstrated that something done by a business firm in business is done "for fun," and is not business, there can be no exceptions to the rule of prime cost. For one thing, at any rate, Mr. Dumaresq is to be sincerely complimented. This is not to imply that he is not an admirable engineer on other counts; but he has been bold enough to do one thing which is, so far as we know, unequalled in electric lighting finance. He has charged 0·53d. per unit for depreciation, which is nearly as much as the entire coal bill of certain central stations. Such an allowance—albeit, based on the not ungenerous estimate of twenty years' life for the plant—would work havoc in most central station accounts. It is right to make the charge, of course; unless the plant is to be run on the assumption that it is to go as long as it will, with ordinary repairs, and then stop and be thrown out upon the scrap heap, without any provision being made for replacing it. It would not have been altogether surprising to have seen it argued that a private producer of electricity or anything else in the way of business need not charge himself with depreciation; but it is satisfactory that this specious contention has not been adopted in the case in point.

Mr. Fletcher W. Stevenson's selection by the Gas Committee of the Coventry Town Council, as Engineer of the gas-works, in succession to Mr. George Winstanley, was unanimously confirmed by the Corporation at their meeting last Tuesday.

The "Electrician" Electrical Directory and Handbook for the current year has been issued. This is the twentieth year of publication; and as time has gone on, the tendency of what is commonly known as the "Big Blue Book" has been to increase in bulk. There is no falling off in the present volume in the amount of information afforded on all matters in which electricity is in any way concerned. The tables and summaries have been brought up to the date of the book (the 10th ult.), and the latest particulars on all subjects of interest to the trade have been incorporated in its contents. Some specially valuable features of the publication are the large sheet tables to be found at the end, which contain statistics of electric supply stations for lighting, power, and traction graphically set forth. In addition to these, the volume contains for the first time a small collection of useful data relating to Colonial and other distant electricity supply undertakings. The interesting Biographical Section, which has been specially prepared for the "Handbook," has been revised up to the beginning of the year.

NOTES.

Automatic Ignition of Stair Incandescent Lights.

A recent number of "Le Gaz" contained a description of an arrangement for automatically igniting the incandescent gas-lights on the principal staircase of a large tenement house at Havre. The architect was desirous of keeping the burners full on till eleven o'clock only, after which hour each tenant would be provided with means of illuminating the hall and stairs until he had reached his apartments. He was able to do this with an appliance consisting of the Besnard automatic igniter combined with a device of his own. To the rising pipe common in houses on the Continent he adapted a bye-pass, formed of a stockcock equal in diameter to that of the pipe, and a bye-pass tube with a pressure-gauge, below which was a shut-off cock. This arrangement allowed of either continuous burning or only pilot-lights. At eleven o'clock the large cock on the rising pipe was shut, and the small bye-pass turned on—the regulator then converting the burners into pilot-lights. In order to illuminate the staircase at any moment, the cock on the rising pipe was connected with a wheelwork arrangement very easily set in motion. Returning home, the tenant pulls a handle near the door, and this moves the wheelwork, keeping the cock open, and consequently the gas-burners full on, for three or four minutes. He has entered his apartments by the time the wheelwork is ungeared, the feed cock shut, and the burners are turned down again to pilot-lights.

Origin of the Fahrenheit Thermometer Scale.

The origin of the conventional divisions of Fahrenheit's thermometric scale is not among the things generally known. Sir Samuel Wilks, writing to "Knowledge," states that Fahrenheit's thermometer owed its beginnings to the invention of a thermometer by Newton, which was described in the "Philosophical Transactions" for 1701. Newton's instrument was a tube filled with linseed oil; and the starting point of the scale was the temperature of the human body, which Newton called 12. It is worthy of notice that at this period, when numeration was based upon natural requirements, the duodecimal system was proposed for this, as it was in use for all other purposes. Newton accordingly divided the space between his datum and the freezing point of water into 12 equal parts, and stated that the boiling point of water would be about 30 of these degrees on the scale. Fahrenheit, when he began to work with Newton's thermometer, did not find the scale minute enough for his purposes. He therefore first doubled the number of degrees; making the scale number 24 instead of 12. Finding he could, by mixing ice and salt, obtain a temperature below freezing, Fahrenheit next adopted this for his starting point, and counted 24 degrees up to body heat; making the freezing point 8, and calling boiling water 53. Later on, he again divided his degrees into four. It will be seen that if the latest of Fahrenheit's figures are multiplied by four, the result is the thermometric scale called after him which is still in use, which retains its popularity by reason of its practical convenience.

Alcohol for Lighting and Heating.

Alcohol is being applied on the Continent to a variety of purposes for which the lighter petroleum distillates are used in the United Kingdom. The chief inducement to this is the dearness of all petroleum derivates in European countries, in consequence of the high duties, to which is superadded the willingness of the Governments to encourge the native agricultural production of alcohol. Herr Arachequesne, a German chemist, has recently described several special forms of apparatus for the utilization of alcohol for lighting, heating, and the generation of motive power. In order that the vapour of alcohol may burn, it requires to be mixed with 7·368 times its weight of air, and must either be superheated, or the air must be heated, to prevent condensation of the vapour. For domestic lighting or heating purposes, the alcohol is vaporized at the burner, either by the heat of the flame itself or by means of a supplemental jet. A litre of alcohol gives about the same heating power as a cubic metre of coal gas; so that the relative values of the two commodities for this application can be readily ascertained. A mixture of alcohol vapour and air can be burnt in an atmospheric burner, provided the mixture is superheated. This can be done when the difference is sufficiently great between the boiling point of the hydrocarbon and the temperature at which it begins to dissociate and deposit carbon, which is always between 325° and 350°C. Alcohol, benzene, and petroleum spirit boil at about 80°C., and therefore there is a margin of about 250° C. for the superheating process to be carried on with safety from carbonizing. But where, as with petroleum boiling at about 250° C., there is not this margin, and yet an admixture of air of ten to twelve times the weight of the hydrocarbon is necessary, this operation fails, and it is impossible to burn the petroleum with a bunsen. In the cylinder of a motor-engine, alcohol is to be preferred to petroleum spirit when the prices of the two are approximately equal, because its exhaust gases are cool and have scarcely any odour. Notwithstanding the inferiority of alcohol in calorific power, it compares favourably with petroleum in the motor cylinder, because it transforms more of its heat units into work. The ratios are: 23·8 per cent. for alcohol, and 13 per cent. for petroleum. The user can thus afford to pay twice as much for alcohol as for petrol. At Ferrières, on a 6-horse power motor, the consumption of alcohol was 438 grammes of denatured spirit per horse power per hour.

PERSONAL.

At the recent half-yearly meeting of the Worthing Gas Company, the shareholders elected Dr. H. J. STRONG a Director, in place of the late Mr. R. J. Cheeswright.

Mr. JOHN REID has resigned the position of Engineer and Manager of the Ceará Gas Company, Brazil. Mr. Reid has been nearly twelve years in the Company's service, having in 1890 been appointed assistant to Mr. T. M'Making, upon whose resignation in 1898 he was promoted to the higher office.

Before his departure from Fulham to take up the more onerous duties of Engineer at Beckton, Mr. IAGO invited the engineering and clerical staffs at the former works to a farewell dinner at Grove House, Fulham, his official residence. Mr. Randall, who succeeds him, was also present, and was thus, by the kindly forethought of Mr. Iago, given an excellent opportunity of making the acquaintance of his future fellow-workers under most pleasant auspices. In response to the toast of his health, and in reply to a few well-chosen remarks by Mr. Edward Mann, the Chief Clerk at the Fulham works, Mr. Iago said that, having spent so many years very pleasantly, and in perfect accord, with those around him, he could not, for many reasons, help regretting their approaching separation. Still he trusted they might not entirely lose sight of each other, but be enabled to meet occasionally; and he should very cordially welcome every opportunity to this end which might present itself. Mr. Iago was also made the recipient of a gratifying token of the high esteem in which he is held by all those who have been associated with him at the Fulham works, in the shape of a handsome solid silver tea and coffee service bearing a suitable inscription. This had been almost unanimously and with the utmost goodwill subscribed for by all ranks of workers, and the knowledge of this when informed of it (as he was by Mr. Edward Mann, who formally made the presentation) caused him to feel (as he happily put it) satisfied and glad that he had succeeded in doing his duty in a manner appreciated by those under him, as well as to the great Company they all served, as he believed, to the best of their ability.

OBITUARY.

We are sorry to learn of the death, at the advanced age of 83, of Mr. S. CHANDLER, one of the founders of the well-known firm of Messrs. Kirkham, Hulett, and Chandler, Limited. Deceased was residing at St. Leonards-on-Sea, to which place he had gone for the benefit of his health. He will be greatly missed by many of his former colleagues.

We regret to record that the gap in the ranks of the directorate of the Crystal Palace District Gas Company, caused by the sudden removal of Mr. Bryan Donkin, to which reference was made last week, has been widened by the death last Thursday, in his 81st year, of Dr. FREDERIC HETLEY, who had for 41 years been a member of the Board. Dr. Hetley long since retired from practice; but, residing at Norbury Lodge, Norwood, he continued his services to the Cottage Hospital. He was a Deputy-Lieutenant for Surrey and Justice of the Peace for Penge.

The Manchester papers last Saturday contained appreciative notices of Alderman JOHN HOPKINSON, whose death on the previous morning at the age of 78, as the result of an attack of bronchitis, removed one of the most familiar figures in the city. He was associated with the Corporation for upwards of forty years, and up to a comparatively recent period, took a prominent part in all that affected the growth of Manchester and the welfare of its inhabitants. The deceased gentleman was by profession an engineer, and his practical knowledge proved exceedingly valuable to the Gas Committee. As Chairman of the Street Mains Sub-Committee, he arranged the boundaries of supply between Manchester and Stockport; and as Chairman of the New Works Sub-Committee, he superintended the arrangements for the Bradford Road works, the corner stone of which he laid in October, 1877. He was one of the representatives of the City Council on the governing body of the Owens College; and, under the provisions of the Technical Instruction Act, 1889, he was a member of the Council of the Manchester Technical School and Mechanics' Institution. In 1882, he was elected Mayor, and gained for himself universal esteem. Himself an able man, he had the gratification to find his four sons, all of whom possessed Victoria University degrees, distinguishing themselves in the professions they adopted. His eldest son, Dr. John Hopkinson, was the well-known electrical engineer, who unhappily lost his life, with three of his children, while on a holiday tour in Switzerland not very long ago; while another, Dr. E. Hopkinson, is with Messrs. Mather and Platt.

The will of the late Mr. James Henderson, the founder, and subsequently the Secretary and Chairman, of the Plymouth Gas Company, who died on the 16th of January last at the advanced age of 85, has just been proved. He left a fortune of about £87,000. After other bequests, he leaves the residue of his property to be divided between five friends, one of whom is Mr. H. A. Willey, of Exeter. Mr. Willey's father and Mr. Henderson were great personal friends; and this friendship has been continued to Mr. H. A. Willey.

TECHNICAL RECORD.

A COMPARISON OF OIL AND GAS LAMPS.

Under the general title of "Mineral Oil as an Illuminant," Professor VIVIAN B. LEWES is giving a series of lectures at the Petroleum Institute, Bevis Marks, E.C. The first was delivered on Monday last week, when Dr. P. Dvorkovitz presided. The lecture on this occasion was divided into four distinct parts: (1) The history of mineral oil lighting; (2) oil-lamps and their photometric value; (3) vitiation of the air of rooms lighted by oil compared with other methods of illumination; and (4) danger of oil-lamps.

At the outset, Professor Lewes referred to the importance of competition in commercial progress. This, he said, is exemplified in the case of both coal gas and oil illumination; for, in spite of the competition of electricity, both are gaining ground instead of losing it—in fact, both in the coal gas industry and the mineral oil industry, we are really only on the confines of their usefulness and prosperity. The last century has altogether been a century of illumination; and has done more in giving us the power of artificial light than the long ages that went before. The history of mineral oil, he supposed he might say, commenced really in 1781, when the celebrated patent of Lord Dundonald was taken out for the distillation of shale for the production of mineral oil—the shale naphtha which was so produced being used in a crude form of lamp. In 1820, coal gas was just beginning to make its way. Naphtha was then distilled from the coal tar, and it was also employed for illumination in lamps which are of the greatest possible popularity to-day among costers. The outdoor naphtha lamps of to-day are the same as those made in 1820 by Read Holliday, of Huddersfield. From 1820 to 1847 may be looked upon as the period of incubation; and the latter year may be termed the start of the petroleum industry, when the Scotsman, James Young, had his attention called to a small spring—not much more than a trickle—of oil which was found in one of the workings of the Riddings Colliery close to Alfreton. From this point, Professor Lewes brought the historical part of his lecture to the present day—including in it information as to the progress of the oil-lamp, from the time of the first American patent in 1859. He next interested his audience by explaining the methods by which the oil-lamp develops its light.

Approaching the economical question, which is really the side governing the true future of oil, Professor Lewes said: You find you have to take into consideration the performance of the oil-lamps—the amount of light they will give, and the amount of oil they will consume. I think we are perfectly willing to admit that there is one thing common between the vendor of oil-lamps and the electrical engineer. If you go into the streets, and look up at the blinking electric lights, you will find the electrical engineer will tell you they are of 1000-candle power. You will, however, find they are of 200-candle power; but you dare not mention that to the electrical engineer. The same amount of leniency is not extended to coal gas. It is hounded from pillar to post; and here in London you have some 24 or 25 stations where the gas is daily tested, and where the smallest falling off in the illuminating power of the gas, or the smallest appearance of impurities in it, leads at once to your lugging the Secretary of the Gas Company up, together with the "morning drunks," to the nearest Police Court. In this way, the results obtained, as far as the standard goes in coal gas, are fairly constant. The vendors of oil-lamps are lucky in having no fixed standard of illumination to attain. No one has yet taken the trouble to make a standard in order to get something by which oil-lamps could be tested, and really fix their illuminating power as compared with the best that oil can do. The oil-lamp manufacturer is able to endow his oil-lamps with any fancy figures of illumination he pleases. They usually speak of them giving 50 or 60 candles; but you do not really find any ordinary lamp that does give that. The duplex lamp gives from 20 to 30 candles; and if it gives over 30 candles, then it is doing uncommonly well.

I think, when we approach the subject of the performance of the oil-lamp, that we should first of all look at the ordinary figures, and then we may take some practical illustrations of what has been done by oil-lamps. Dr. Boverton Redwood has made careful tests with regard to the light given by oil-lamps: and the figure he has put forward is that a really good duplex burner, with a consumption of 50 grains of oil per hour, will give 1 candle illumination, and with a good circular-wick burner, and 45 grains consumption, will give 1 candle power per hour. [Professor Lewes then referred to the tests made by himself with a number of lamps such as are in common use, and with both American and Russian oils; and the tests, in many cases, bore out Dr. Boverton Redwood's figures.] Among other remarks of the lecturer were these: Some lamps are not fitted for the consumption of Russian oil. Take the 60-line Veritas circular wick lamps for example, there is considerable difference between them in the consumption of American and Russian oil—64·5 grains of American oil per candle power per hour, and 112·5 grains of Russian oil per candle power per hour. Some lamps, however, are better adapted for the consumption of Russian oil, and in them it practically comes up to the American. In the Duplex lamp for instance, I got a rather better candle power from the Russian oil than from the American.

Then we have Dr. Redwood's authority for saying that, when Russian oil is burned over a long period, it approaches in its results more nearly to the American. However, we may take it that 50 grains of oil per candle per hour is a convenient basis.

Taking a fair average lamp oil which has a specific gravity of ·8, inasmuch as you have to pay at the oil shop 8d. per gallon for good forms of oil, this is equivalent to oil at 1d. per lb. Now, if you get 1 lb. of oil for 1d., and the candle of illuminating power for 50 grains, then we shall get from that pound of oil—7000 grains, divided by 50, equals 140 candles for the penny. Now how does this compare with coal gas. With coal gas, the light developed is absolutely dependent upon the burner in which it is used. Taking flat-flame gas-burners, you find that, according to the amount of gas they consume, so is the candle power which they emit per cubic foot of gas. If we take a No. 7 burner, it will be found that it will give 2·4 candles per cubic foot of gas; and if we take a No. 4, it will give 1·7 candles, perhaps rather less. But taking the whole range of the flat-flame burners from No. 4 to No. 7, a fair average is 2 candles per cubic foot. With the London standard argand, and 16-candle gas, 3·2 candles per cubic foot; 3 candles per cubic foot being a fair average. But coming to regenerative burners, a much better duty is realized. An average of 7 candles per cubic foot can be obtained with them. Ten candles can be got; and when great attention is paid to the regenerative burners 10 candles is a fairly common duty. You can get up to 12 candles; but then you can only use the lamp a few weeks, owing to the intense heat. Then, finally, the gas can be burned in that requirement of modern-day gas lighting—the incandescent mantle; and, if I take a fair average for that, I shall not be far wrong in saying 17 candles per cubic foot of gas consumed. At the present time, you can take dozens of mantles and test them up to 20 and even 22 candles; and you will find a considerable number of them drop in light very rapidly, with the consequence that you will find quite as many twelves as twenties. We may therefore take 17 candles as a fair average for incandescent mantles. Now, supposing we take coal gas at 3s. per 1000 cubic feet—I should be sorry to say the Gaslight and Coke Company are going to descend much below 3s. in the immediate future—and the figures already mentioned as representing the duty obtained per cubic foot of gas consumed, we find the candles we can get for 1d. will be: By the incandescent gas mantle, 470 candles; by the regenerative lamp, 221 candles; by the oil-lamp, 140 candles; by the argand gas burner, 83 candles; and by the flat-flame burner, 55 candles. You have there a fair comparison—not made by straining figures in any way. The comparison between the economical value of oil and coal gas shows that, with the modern forms of burner, oil cannot compete with coal gas; but with the flat-flame and the argand, the oil-lamp has all the advantages of economy. Oil shows an enormous advantage over either the argand or the flat flame; but it goes down at once before the regenerative lamp and incandescent burner. After all said and done, however, this is not a serious matter, because the people who use oil-lamps are not the people, as a rule, who will ever use mantles, and certainly would never use a regenerative gas-lamp, owing to the high initial cost of installing that luxury. Now you see in this way you have the economical side and character of the oil-lamp fairly established.

Let us see if there is anything else which we can find which places the oil lamp in front of other illuminants. Examining carefully the conditions in our suburban houses, we find in many drawing-rooms the candle and the oil-lamp installed in preference to coal gas. If you ask your hostess the reason for this, she will tell you that the candles or the oil-lamps vitiate the air so much less than the coal gas. When you come to examine the truth of this statement, you find the following are the facts: We may take the composition of the oil as being about 86 per cent. carbon and 14 per cent. hydrogen. From this, the thermal efficiency of the oil can be fairly well arrived at, and one can, from the composition of the coal gas and the composition of the oil, arrive at the products of combustion given off by both. You would find, for every candle of light which you obtain by the combustion of the oil, on the basis of 1 candle for every 50 grains of oil consumed, 0·24 of carbon dioxide and 0·18 of water vapour. Then, for gas-burners, the flat-flame gives off rather more carbon dioxide (0·26) and 0·67 of water vapour; the argand 0·17 of carbon dioxide and 0·45 of water vapour; the regenerative lamp, 0·07 of carbon dioxide and 0·19 of water vapour; the incandescent lamp 0·03 of carbon dioxide and 0·08 of water vapour; while the innocent sperm candle, which is looked upon as the emblem of all purity, gives 0·41 of carbon dioxide and 0·41 of water vapour. Though the oil-lamp has a slight advantage over the ordinary gas flat flame as regards carbon dioxide, yet the carbon dioxide from the oil flame is greater than from any of the other form of gas illumination. Inasmuch as it is carbon dioxide upon which the sanitary authority always bases his ideas as to the fitness of an atmosphere for respiration, you will find that, upon that basis, the innocent candle would be the worst offender of all, the oil-lamp would come very nearly next, and then the gas, according to the way in which it is burnt, shows far better results. But, you will say, in a room lighted by oil, one does not feel the heat so oppressive as in a room lighted by gas. Why is this? In the first place, there is a craving for more light; the more you have of it, the more you want of it. The craving grows upon one to an extraordinary extent. Now, when coal gas is laid on to half-a-dozen burners in a room, generally those burners are all alight at once; but when burning oil, only one lamp is, as a rule, going at a time, and that on the table quite near you. Again, when using candles, only one or two are placed on the table by your side. But with the candles, you are content with a small amount of light. When using the oil-lamp, you get a larger amount of light; and with coal gas, a larger amount still.

This is one factor. Another, and a far more important one, is this, that you find the real impurity in air which renders that air unfit for respiration is the organic matter which comes off with the carbon dioxide from your lungs and skin while you are inhabiting the room. But it is exceedingly difficult to estimate the organic matter, and so the sanitary authority takes the carbon dioxide to show the fitness of the air. Take the case of gas burning from a chandelier. The products of combustion leave the flames at nearly the temperature of the flame itself, and rise up and go to the ceiling space; and, if these products are not rapidly carried away, they fill the whole top of the room down to the level of the gas-burners. Now the organic products from your body and breath are coming off at a temperature of not more than 98° Fahr.; the temperature of the products of combustion of the gas are coming off at a far higher temperature; and the hot layer at the top of the room is above the temperature of the products which leave your body. What is the result? You get the ceiling level of the room, so far as the products of your body go, brought down to the level of the chandelier. You have above that point air so hot that the products of your body cannot penetrate through it. If instead of using gas in this way, there is an oil-lamp on the table, it will be found that the lamp will give off its products at the table level, also at a very high temperature. But those products go upwards in one stream, and get fairly cooled as they pass up through the much greater travel of air. The result is that these products, as they collect at the top of the room, are far less heated. Therefore the products from your own body are carried up much nearer to the ceiling, instead of being at a much lower level; and this has a great deal to do with the feeling of oppressiveness that one gets in a room where gas is used.

It will be seen that the oil-lamp, although it gives carbon dioxide which is very nearly as large in amount as that given by the flat flame, yields an amount of water vapour which is enormously smaller. Now when the air of a room gets saturated with water vapour, as it does very soon when using gas-flames, it is found that the water which is always being drawn off the surface of your body as perspiration gets checked, and the amount of water vapour given off from your body is very much reduced, owing to the air already having got so much water vapour that it does not require to draw more from your body. In this way, you have a certain check to the actions of the body; and the oppressiveness of the room gets greater.

It may be urged that there is a certain amount of sulphur in coal gas. The quantity in highly purified coal gas is, however, so small that, by the time it is burned at the flame, and the products diluted by the air, the amount of sulphur compounds have very little practical importance indeed. After all, paraffin is known not to be always free from sulphur itself; so that it is just as well not to dwell too much upon that point.

However, you find all these factors taken together really render your oil-lamp in a room less oppressive than the gas-flame, because you are doing with less light, you are getting a less accumulation of hot air above, and you are not getting nearly so much water vapour produced.

Now, turning to the amount of heat which the flames give off, there again you can readily arrive at the relation between the heat developed by the oil-flame and by the gas-flame. Where a big oil burner is used, the heat developed is enormous; and if you take one of the finest oil-lamps—a big "Veritas" lamp, with its 60-line burner and large flame—you have a result which, in a dwelling room, would be akin to converting the room into an oven. It might be most acceptable in a country chapel on a winter night; but in a dwelling room it would be impossible. This gives a limit to the size of your oil-lamps. Comparing the heating effect of oil-lamp and gas-flame, with the former you get 336 British thermal units per candle, and with the flat flame 310. This is perhaps a little low for the flat flame. The thermal value of the London gas is as nearly as possible 650 British thermal units. Here we have our flat flame taken as 2 candles per cubic feet; so it would make it 625 British thermal units. The heat which is generated in the oil-flame has to convert the oil into gas; and a certain amount of heat is used up in this way; so I think it fair to say that the oil-flame and the flat flame are just about on a par for their heat.

While one is making these various reflections on oil and gas, there is one thing that must pass through one's mind. It is this, that we have only had coal gas taking the enormous strides forward in the regenerative and incandescent burners (which have placed them ahead of oil) in the last fifteen years; and if these factors which have put gaslight so far ahead can be applied to oil-lamps, why should not the oil-lamp show an increase in utility? In one of my later lectures, I shall show you that this step has been very nearly practically realized. You can, by adapting the incandescent mantle to the oil-lamp, get very fine results; the only thing is that you have to obtain the form of oil-lamp which will behave itself with decency under all conditions. And you will find there are various ways in which these advanced methods of burning oil can be applied in a highly satisfactory way.

We are told by the halfpenny press that these petroleum lamps

cost one life a day. There is no doubt there are an enormous number of accidents; but when we come to examine them, 80 or 90 per cent. of them are accidents which ought not to happen. If, in the first place, you could sweep away at one fell swoop all the cheap garbage which is sold in the name of lamps in poor neighbourhoods—things which are unfitted for burning mineral oil in, you would find one-half of the accidents done away with. Professor Lewes proceeded to deal with the numerous other small factors which go to make up a general run of lamp accidents; and he ended his lecture by saying that most of these are factors which could easily and readily be abolished. Even if the more glaring of them were done away with—such as the accidents from cheap oil lamps, the moving and improper methods of extinguishing lamps—it would be found that the death roll for mineral oil lamps would come into decent comparison with accidents from other forms of illumination.

Dr. DVORKOVITZ, in proposing a vote of thanks to Professor Lewes for his interesting lecture, pointed out that the oil-lamp stood very well in the comparison with the argand and flat-flame gas-burner. After all, incandescent gas mantles and regenerative lamps were not in general use in this country; and most gas consumers still used flat-flame burners. It was quite true, it would be most important if a standard for oil-lamps were introduced. He was quite sure, if the Government did not insist on a standard of illuminating power and purity for gas (which was supplied with such perfection by the gas companies), the supply would be exceedingly inefficient. He was confident that the chief oil-lamp accidents were due to the non-existence of a standard lamp, and to the presence of the cheaper lamps.

The vote was heartily accorded.

Professor LEWES, in responding, said he quite agreed with Dr. Dvorkovitz that a standard for oil-lamps would be an excellent thing to introduce to get greater equality in the lighting power of the lamps, and to give the lamp makers some standard to work to. One could not imagine any great industry, such as the oil-lamp industry had become, working without any guide, excepting the guide of public opinion. As it was, most makers were rather in the dark as to what they were really aiming at; and he was sure every lamp manufacturer would be only too pleased if some lamp standard were devised for him to work to. A standard lamp would have nothing to do with accidents; but a little common sense brought into the use of oil-lamps would do more than any amount of restrictions.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Training of Young Gas Engineers.

The Monthly Meeting of this Association was held on Saturday, at the Technical School, Princess Street, Manchester—Mr. S. E. HALLIWELL presiding. The proceedings were devoted entirely to a discussion of the points raised in the article headed "The Sons of Engineering and of the Gas Industry," contained in the "JOURNAL" for the 18th ult. (p. 398).

The PRESIDENT, in opening the discussion, said: The Secretaries, in their notice convening to-night's meeting, have drawn your attention to a section of the Editorial Notes in the "JOURNAL OF GAS LIGHTING" for February 18, which is headed, "The Sons of Engineering and of the Gas Industry." The Council, at their last meeting, considered this would be a suitable subject for discussion at this meeting, and decided to introduce the matter, to see if we could not hit upon some course of action in order to further the suggestions contained in the article in question. I presume that most of you have read it, and are familiar with the topic. After dealing with the methods adopted by the Institution of Civil Engineers and the Institution of Mechanical Engineers for the encouragement and assistance of the younger members of the respective professions, the writer comments on the absence of such facilities in the gas industry, and appeals to the Gas Institute and the Institution of Gas Engineers to consider the matter. I find that the subject had the consideration of the Gas Institute in 1887, on the suggestion of Mr. William Foulis, who mentioned the matter in his presidential address of that year. After speaking of the value of education for the younger members of the profession, Mr. Foulis suggested that the Gas Institute should take up the matter, not as an examining body, or in any way to interfere with the work of the City and Guilds of London Institute or Technical Departments, but to provide further facilities in various centres for the education of those anxious to enter the profession. Mr. Foulis pointed out that in nearly all other important branches of manufacture there are lecturers or professors connected with technical colleges, &c., in the principal towns, specially appointed to guide and direct young men in the course of study best suited to their particular profession. He then suggested that the Institute might secure the services of several lecturers to organize lectures at various centres. The matter was considered by the Council, and a Committee was formed, who recommended: "That where a desire for instruction in gas manufacture exists, local effort for the establishment of lectureships or technical classes be encouraged by grants from the funds of the Gas Institute, or by other means, and with the co-operation of the District Associations, and that such lectureships or classes so subsidized be confined to members and associate members of the Gas Institute (who shall be entitled to free attendances), and to other persons employed on gas-works, on payment of a moderate fee." This was certainly a step in the right direction. But I have been unable to trace any definite action which resulted from these recommendations; and I am not in a position to say why they were not adopted, if such was the case. It is for us to decide to-night whether or not we shall further the interests of gas-works students generally, by petitioning the Senior Association to reconsider the question of providing more facilities for a thorough study of matters connected with the gas industry. There is no doubt whatever in my mind that students in gas manufacture are placed at a great disadvantage; and surely this must be considered an important matter. As the article under consideration points out, the next few years will probably be the most critical in the history of the industry. This being so, is it not imperative that the young men who have eventually to fill the higher positions ought to have every facility for increasing their knowledge in all branches of the profession, and to enlarge their ideas and conceptions in matters connected with the industry? Let us just for a moment consider the present position. A young man starts his career on a gas-works with a laudable and genuine ambition to succeed in attaining one of the higher positions. He naturally looks around for some organization which can help him in his determination. But in how many cases must he look in vain in our particular industry? In most other industries, he can see advantages offered to students in the form of technical classes, organized associations, and lectures; but a careful study of his own position reveals a peculiar state of isolation. He has few or no opportunities of meeting with other students interested in the same subject; and often he must take up a private course of study without guidance from some experienced hand. The methods adopted at his own particular works, which may be small, are firmly rooted in his mind, and he works up his ideas on that basis. Processes not adopted at the works where he is employed are absolutely foreign to him; and he forms, oftentimes, absolutely false impressions, and confusion prevails in his mind. I daresay most of us have experienced this feeling of confusion, in our individual efforts to increase our knowledge. He attains what he considers, in his limited conception of the duties of the position he seeks, the requisite amount of knowledge; but directly he steps beyond his own boundary walls, he is astonished at the wide expanse in the field of learning which yet remains unexplored by him. From his new vantage-ground, he realizes that his knowledge is very rudimentary, and that, ere he reaches his goal, he will require a superabundance of perseverance to overcome the difficulties which will surely present themselves. It is at this juncture that some organization would be of great service to him, whereby he could meet others interested in the same pursuit. But he has all too few chances in the gas industry. There are not many centres that have the advantages of classes in the subject; and I am quite of opinion that a very large number of those who are anxious to succeed in the profession have little or no facility in their own district. Our Junior Association has, I feel sure, supplied a long-felt want in our own district. Since its formation, three years ago, by the kindness and courtesy of gas engineers and owners of gas engineering works, we have had opportunities of visiting many works, which must have the effect of modernizing our ideas and extending our general knowledge. Then the intercourse and exchange of opinion which is rendered possible by our meeting together, is bound to have a beneficial effect. In this respect we may consider ourselves fortunate in comparison with other centres. Personally, I am still of the opinion which I have previously expressed, that it would be a great boon to the students of the country, if similar associations to our own could be formed at a number of convenient centres. But this matter is entirely in the hands of the students themselves. The practicability of such a course is amply proved in our own case. Then, as the "JOURNAL" suggests, if the Senior Associations could be prevailed upon to consider the whole question, and devise some scheme for encouraging the formation of classes, lectureships, &c., the industry generally would derive much benefit, by raising the standard of efficiency among its junior members.

Mr. THORP said the "JOURNAL" asked what were the Institution of Gas Engineers and the Gas Institute doing in the way of specially encouraging the young gas engineers. He thought the answer was, as the writer added: "Absolutely nothing." The question then occurred to him (Mr. Thorp) as to what the young gas engineers were doing themselves. The answer to it, in their case, was seen in the Manchester and District Junior Gas Association. The meetings they had held had been productive of much good. One suggestion he would like to make, with the view of bringing the Association more prominently under the notice of the Senior Associations, was that they might occasionally ask one of the senior engineers to come and take the chair at a meeting of their Association. Another idea he might mention was that any paper which the Committee thought of special interest might be forwarded to the Senior Association so as to be judged upon, and possibly, if considered of sufficient merit, read at one of their meetings. The President had observed that they were coming to a very critical period indeed in the gas industry. He thought this was so. The scare about the electric light was perhaps not so great as it had been; but still it would have to be looked to. The electric people had now the Nernst lamp, which

instead of the ordinary filament, had an incandescent mantle, by which a better light was obtained; and one of the electricians in the Technical School was experimenting on a lamp which was to give 4 candles per watt, instead of 1 candle per 4 watts, of electricity with the present arc lamp. It was only in the experimental stage at present—in fact, it had been there for the last ten years; but that was by the way. Anyhow, they would have to be on the look-out, and adopt all means in their power with a view to making further progress in the gas industry.

Mr. GARLICK remarked that they did not want the Senior Associations to get the idea they—the Junior Association—were in any way antagonistic to them. The Junior Association was formed to enable members who were not eligible for the Senior Associations to improve themselves by means of meetings, papers, and visits; and he would like the Senior Associations to know they were not antagonistic to them in any way, but rather an auxiliary body. Since they had started the Association, several of their members had been made eligible for the Senior Associations. With regard to the matter commented upon by the "JOURNAL," it might to a certain extent be due not to any unwillingness on the part of engineers or Associations in giving information to the juniors, but rather to thoughtlessness. In the visits their Association had made, the engineers at the gas-works had generally been only too willing to afford any information required on any particular point; and the same applied for the most part to the makers of appliances and apparatus. It would be a good thing if similar Associations to their own were formed up and down the country, and if the Senior Associations would send papers in turns to these Associations dealing with particular questions connected with the gas industry. There was another point that he would like to mention. He thought we were considerably behind in England as regards the chemical side of the gas industry. It might be well if a joint body of the Senior Associations were to employ two or three chemists, who should have access to the various works to carry out research work on the different questions that required investigation in connection with the chemistry of the gas industry. Very great benefit would, he thought, be derived from such a course.

Mr. HILL observed that before they asked what had the senior engineers done for them it would be well to consider whether they had really asked them to do anything. It would, in his opinion, be a good thing if the senior engineers, along with the companies and corporations, would make arrangements with the Technical School, and get up a sort of department which should be equipped with all the apparatus that was possible, so that those attending the class could actually see the apparatus that was spoken of by the teacher.

Mr. BRADDOCK said that their Junior Association was, as he took it, a kind of stepping stone to the Senior Associations; but they could scarcely send papers to the Senior Associations with the idea that they would be read at their meetings.

Mr. TAYLOR remarked that at the beginning of the article under discussion, the Editor said the next few years would be critical years in the gas industry for engineers and managers. The old days of the "rule of thumb" were dead; and the man who aspired to control a gas-works must be a man with all his wits about him. His head must be crammed full of all the science he could get into it. They had to maintain their ground against the advance of electricity; and in order to do so, they would have to get all the knowledge, both practical and scientific, that they could possibly obtain. Undoubtedly, the gas industry had something to lose. Electricity had everything to gain. It, therefore, behoved them to get as much technical and practical knowledge as they could, so that they would always be able to produce a light that would be ahead of the electric light; or, if they failed in that, to produce gas which could be used for other purposes. As to the advantages afforded by visits to gas-works and establishments where various appliances and apparatus were manufactured, their Association had for three years been carrying out that idea; and the members had widened the borders of their knowledge considerably by going to different works, and seeing the different methods in operation there. He supposed our Continental friends could give us a point or two not only in chemistry, but also in producing gas engineers. He believed that in some of the larger works on the Continent the juniors, and those who were qualifying to become managers and engineers, had to spend part of the week at a technical school, and the other part inside the gas-works. He thought that was the ideal training for a gas engineer, or anyone who wished to become a gas engineer. Part of his time should be set aside for the technical or scientific part of his duties in getting knowledge from the very best sources, as in a technical school, and the other part of his time should be spent in the practical, or, to take the topical phrase, the "spade work" of his profession. This would ensure good results.

Mr. BRADDOCK, referring to their relations with the Senior Associations, observed that Mr. Ritson, in his presidential address to the Manchester Institution, made some flattering remarks about the Junior Association; and these were very well received by the majority of the members. Personally, he thought it would be a good thing if they occasionally got some of the seniors to give papers at their meetings.

Mr. CRITCHLEY pointed out that there was a deficiency of classes in gas manufacture as compared with those in connection with other industries. For instance, at St. Helens they had to come to Manchester if they wanted to learn anything about gas manufacture. He thought that there were hardly enough classes in gas manufacture up and down the country.

After some further discussion, it was resolved, on the motion of Mr. Garlick, seconded by Mr. Thorp, that: "The Manchester and District Junior Gas Association thank the Editor of the 'JOURNAL OF GAS LIGHTING' for his expression of opinion in the article 'Sons of Engineering and of the Gas Industry,' appearing in the issue of Feb. 18; and they are of opinion that, if the matter is taken up by the Senior Associations on the lines suggested, it would be a boon that would be of lasting benefit to the gas industry of the United Kingdom. They furthermore suggest that expressions of opinion on the matter be invited through the 'Correspondence' columns of the 'JOURNAL OF GAS LIGHTING.'"

THE FOULING OF ACETYLENE BURNERS.

The deposit of carbon which rapidly appears on acetylene burners, if they have very small orifices, has not been studied very exhaustively hitherto; but M. Fernand Gaud recently reported in the "Comptes Rendus" some observations he has made which tend to elucidate the real cause of the deposition. It commences, as those who used small Bray burners for acetylene in the early days of the commercial application of that gas will remember, with a blackening of the burner orifices, followed by an annular deposit of carbon. This deposit goes on increasing in size, and assumes most varied shapes, while the flame becomes irregular. Remedies have been sought empirically by modifying either the burner or the gas. Some have attributed the fouling to the high temperature of the burner causing decomposition of the gas; and, in order to render the gas less sensitive to the heat of the burner, have diluted it with another gas or air, and have in this way produced the mixing burners, in which air is drawn in by the outflowing gas. On the other hand, some persons have supposed the fouling of the burners resulted from impurities in the gas, and consequently they prescribed drastic purification as a remedy.

In the face of these divergent views, M. Gaud has made his exhaustive investigation of the question. He first of all consumed chemically pure gas, and then, in the same burners, gas contaminated in turn with each of the common impurities. It was thus proved that, provided the heat taken up by the material of the burner may be transmitted to the gas, and favour its decomposition into its elements, the presence of sulphuretted hydrogen and sulphur products certainly provokes this decomposition.

M. Bullier, in an earlier study of the fouling of acetylene gas-burners, had attributed the separation of carbon to the decomposition of polymerides of acetylene, which were formed inside the burner, owing to the small size of the burner orifices in comparison with the cavity in which the gas accumulated before it issued from them. In order to prove the accuracy of this view, M. Gaud took acetylene which he had purified as completely as possible, and burnt it from "30-litre Manchester burners" (say 1 cubic foot Bray burners). The formation of carbon became plainly in evidence after from 12 to 15 hours burning under the normal pressure, by the appearance of a deposit at the edge of the cup of the burner, where it is licked by the flame. In 100 hours the deposit had increased in thickness and extent; but it never extended to the orifices of the burner. On reducing the pressure, however, until the flame became short and thick, and it touched a larger area of the burner, blackening occurred in a few minutes, and the characteristic filament appeared in a few hours. With pure acetylene, however, appreciable obstruction of the gas passages was not found until after 60 hours' use. This observation, that when the burner is being used normally there is no obstruction, while when the flame is reduced to a minimum obstruction occurs, is not incompatible with Bullier's theory.

It is generally accepted that the polymerization of acetylene is possible from a temperature of 100°C. upwards. As the fouling according to M. Berthelot follows on this polymerization, it should suffice to determine whether the gas burnt in the cases in which a distinct fouling occurred attained a preliminary temperature of 100°C. or over, and *vice versâ*. There was no ready means of determining directly the temperature of the gas within the burner; but it was possible to arrive at the temperature of the burner itself, and to calculate therefrom the rise of temperature of the gas during its stay in the burner. The formula for the calculation is one by Witz:—

$$\frac{d\,t}{d\,\theta} = v = \alpha\,(\beta\theta + \gamma\theta^2)$$

in which θ expresses the temperature of the inclosing walls in degrees Centigrade; t, that of the air; v, the number of degrees acquired in 1 second; α, β, γ, co-efficients, which for air are 1·48, 0·11, and 0·0019 (acetylene is assumed to have the same conductivity as air). Then taking account of the fact that the mean volume of the burner cavity is 0·25 c.c., and the temperature of the walls of the burner 400° C., the following figures are found for the temperature of the gas in the burner:—

Discharge per hour in litres	2	4	10	20	30
Temperature ($d\,t$)	231°	115°	46°	23°	16°

These results show that polymerization only becomes possible when the gas delivered from the 30-litre burner falls below 5 litres, or less than one-sixth of the normal consumption. Hence M. Bullier's theory must only be accepted with this reservation.

CARBURETTING AIR FOR LIGHTING PURPOSES.

Reference in a recent issue of the "JOURNAL" to the employment by Mr. Vernon Harcourt of air carburetted by pentane for the lighting of a billiard-room, and a subsequent article bearing upon the subject, have re-awakened interest in the possibility of "air gas" occupying a considerable portion of the field of illumination as a competitor of coal gas, electricity, acetylene, and oil, especially for villages, towns, and, more particularly, isolated establishments of large size. Without attempting to discuss such an eventuality from the economic standpoint, it may not be unprofitable to glance at what has been done across the Channel, by the French Aërogen Gas Company, in the direction of the practical application of carburetted air for the purposes of illumination. It may be remembered that M. Bouvier, of Lyons, told the members something about the Company's work at the meeting of the Société Technique at Dieppe last July, as noted in our report of the proceedings at the time. The Company's plant has been adopted in eighteen places, with a total population of 40,000, supplied with air gas through about 45 miles of pipes; and these figures would be greatly exceeded if the installations belonging to industrial and other large establishments were included. It will be seen, therefore, that the system of illumination with which we are now dealing has obtained a footing in France. Its extension will depend upon whether the plant can be introduced and worked cheaply, and whether the illuminant produced by it is permanent, and of a quality to enable it to hold its place among its rivals.

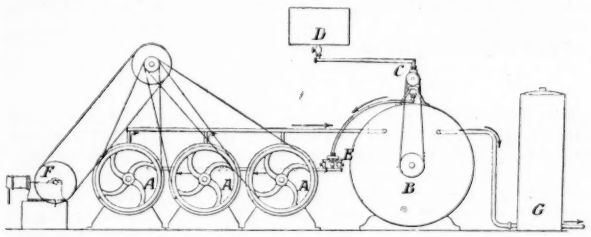


FIG. 1.

The general arrangement of the plant is shown in the accompanying illustration (fig. 1). A A are the carburettors, B is the meter, surmounted by C, the *doseur*, or drop-measurer, D is the mixing-tank, E the distributing chamber, F the motor driving the plant, and G the regulator. Two kinds of carburettors are employed, according as the pressure required is heavy or light.

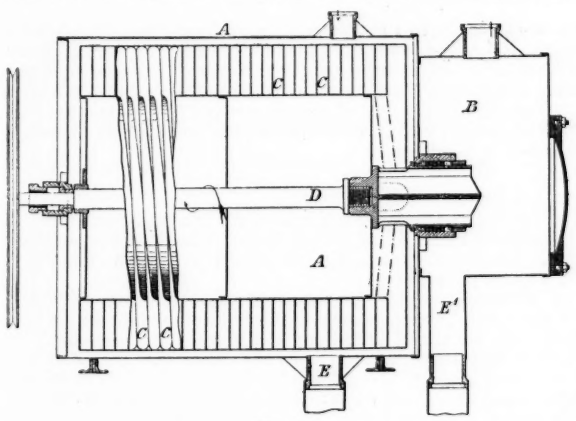


FIG. 2.

The one shown in fig. 2 is of the former kind. It is of the Van Vriesland type, and is constructed on the principle of a quadruple archimedean screw turning upon a horizontal axis. Each of the four coils C, which are square in section, winds round a drum. In front, their orifices project on to the end of the drum; at the back, they communicate with the chamber B by means of the hollow part of the shaft D, which is furnished at either end with a stuffing-box. The hollow journal is divided by a cross-piece into four compartments, each connected by a pipe radiating with one of the coils. These turn in the chamber A, which is in direct communication with the compartment B by the U-pipe E E' (the curved portion of which is not shown in the drawing), as well as with the outside by a valve which allows only air to pass to the interior. The shaft D carries a grooved pulley, which imparts motion to the four coils. In the chamber A, which is about one-third full of water, the orifices of the coils, owing to the rotation of the drum, dip successively into the water, and carry some away. Then they again emerge from the liquid, and allow a certain quantity of air to penetrate into the channels. At the following immersion, they remove more water, while that taken up during the preceding turn passes into the following coil. Consequently, after a definite number of revolutions, each coil has a layer of water on the lower part and a layer of air at the top. As the coils communicate with the compartment B, the rotation of the drum causes a constant flow of air and water into it; but as the air can only find a limited number of outlets (depending upon the burners, &c., supplied) it is compressed, and lowers the level of the water in the branch E' of the U-pipe. If the pressure became greater than that which was balanced by the depth of water in this pipe, the air would return to the first compartment. When there is no consumption, the production of gas ceases. The second kind of carburettor—the low-pressure—consists of an ordinary gas-meter, the elongated axis of which carries a grooved pulley to communicate rotary motion to it. The carburettor, like the Van Vriesland one, is filled with water to the extent of one-third of its capacity; and the flanges of the interior drum successively dip into the water, and drive air into the pipes under a certain pressure, which cannot exceed that represented by the depth of the water. The carburettor in this case also is automatically regulated. If a small quantity of hydrocarbon is poured into the water contained in either carburettor, it will float in a very thin layer on the top. Rotation of the drum then has a double effect—compression of the air, and evaporation of the hydrocarbon moistening the inner sides of the coils, which, by drying during part of their rotation, give off the hydrocarbon fumes to the air. In short, instead of getting pure compressed air, it is carburetted air which is driven into the pipes.

In order that the composition of the product formed may be constant, the volume of gas supplied by the carburettor must always contain a proportionate quantity of hydrocarbon. This was a difficulty which presented itself; but it has been overcome by M. Alfred Guy, Engineer of the Company, who devised the *doseur*, or drop-measurer, bearing his name. Previously, there had been two obstacles associated with "lapping" carburettors. In the first place, the over-rich carburetted air was condensed in the pipes in the form of liquid hydrocarbons; and, secondly—and this was the greater inconvenience—its composition varied according to the temperature, the flow of gas into the pipes, or the time during which the generator was working. As the Company's business was illumination by means of carburetted air, they could not carry it on without manufacturing a gas of perfectly

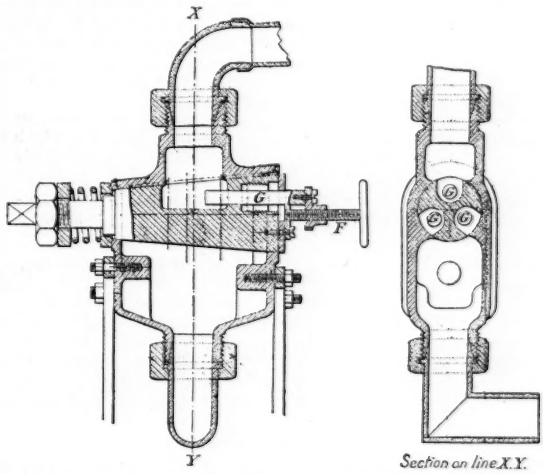


FIG. 3.

uniform composition as regards the percentage of hydrocarbon contained in it, and one which never condensed. Thanks to M. Guy's appliance, the amount of hydrocarbon in the carburettor is always proportionate to the discharge of gas, so that the latter can be maintained far from saturation-point, and constant in composition, whatever may be the temperature, discharge, or duration of working of the apparatus; nor is it necessary to employ a constant-level tank. The *doseur*, which is shown in fig. 3, consists of a bronze cock, the plug of which is furnished with several cavities to measure out the hydrocarbon. In order to accurately titrate the gas, slight corrections are made by the aid of the screw F, rotation of which causes the rods G to advance or recede; thus increasing or diminishing the volume of the cavities. Usually the gas-meter in an installation of plant is utilized to work the *doseur* by the rotation of its drum, and by an endless chain running on sprocket wheels, which reduce the velocity to one revolution per minute. The top part of this *doseur* communicates with the tank D (fig. 1), or gasolene vessel, and the lower part with the compressor-carburettors. The hydrocarbon admitted into the latter spreads out on the water in a very thin layer, and immediately evaporates. After leaving the carburettors, the gas passes through the meter B, which, of course, rotates at a speed exactly proportionate to the flow of gas. It is the same with the *doseur*, which, however regulated, always discharges the same quantity of liquid hydrocarbon per revolution, so that the composition of the gas remains perfectly uniform.

The Company employ for carburetting the air a mixture of benzine (sp. gr. ·680 to ·710) and gasolene (sp. gr. ·650). The proportions of this mixture are varied according to the temperature, so as to permanently employ the maximum of the cheaper product (benzine). In large plant feeding from 100 to 300 burners, the two liquids are mixed in the tank D (fig. 1) by the aid of air-pumps exerting a pressure at the top part of the spirit-vessels, which are respectively connected by flexible pipes with these

reservoirs. This pressure causes the liquid to ascend in the tank, the discharge-cock of which is open. The mixture is made in any proportions by the aid of a graduated vessel. The tank D should be equal to one day's consumption.

The carburettors are worked by a gas or hot-air engine, located as shown at F in fig. 1. It only runs when the gasholder (which is never completely emptied) has to be filled. When full, the engine is stopped. With carburettors of the meter type, $\frac{1}{8}$-horse power suffices for five, each producing 350 cubic feet of gas per hour, at 4 inches pressure. These carburettors perform ten revolutions per minute. For the Van Vriesland carburettors, which make 35 revolutions per minute, considerably greater power is needed. The regulator does not possess any special feature; it merely maintains the circulating gas at a constant pressure, which may be regulated when necessary.

According to the communication of M. Bouvier already referred to, aërogen gas is usually manufactured of a quality equal to 2600 calories per cubic metre, using 1 litre of gasoline to 3 cubic metres of air. Gas of this quality is considered to be constant. It can then be utilized with incandescent burners, as well as for stoves and ordinary gas-engines. In fact, it is a "poor" gas, in which the hydrocarbon vapour is diluted in so large a volume of air that it is far from its saturation-point. Consequently, the gas is not very liable to condensation so long as it is produced of the quality specified. With a gas of this standard, the calorific effect per available heat unit, and consequently its luminous power in incandescent burners, is superior to that of ordinary gas. M. Guy asserts that he has obtained one carcel-hour with 25 litres (0·88 cubic foot) of his gas, when it would have been difficult to obtain this result with 12·5 litres (0·44 cubic foot) of coal gas at 5200 calories per cubic metre. According to M. Bouvier, this superiority is explained by two causes. In the first place, the presence in the aërogen gas of a certain quantity of air tends to augment the temperature of the bunsen flame, and increase the efficiency of combustion. Coal gas, on the other hand, being richer in hydrogen, some of the heat units (about 15 per cent.) which are liberated by its combustion with condensed products are not utilized in the incandescent burner, whereas combustion, in conjunction with a mantle, of aërogen gas richer in carbon suffers less loss (7 or 8 per cent.) between the total calculated heat and that which is utilized. The French Company state that their gas contains four times less hydrogen than coal gas, and burns at a considerably greater temperature.

In distribution, aërogen gas requires the same precautions as coal gas, though it is heavier than air. Scrupulous care is also needed in storing and handling the spirit. The gas has a peculiar odour, so that an escape can be detected. The site required for plant for the production of this gas is very small. Apparatus for the supply of 100 burners could be placed on a table 6 ft. by 3 ft. Little supervision is needed. When once the plant has been started, which takes very little time, it can be practically left to itself, as it is self-regulating. The whole or a portion only of the burners, stoves, &c., supplied may be ignited or extinguished, without any regard being paid to the generator. Though the Company make a speciality of furnishing light, heat, and motive power by means of gas, the appliances here described are recommended by them for the cold carburetting of ordinary coal gas, which, it appears, is being done with complete success at the Toulon Gas-Works.

EXPLOSIVE LIMITS OF COMBUSTIBLE GASES.

By Dr. P. Eitner, of Carlsruhe.

[Abstract Translation of a Series of Five Articles in Recent Numbers of the "Journal für Gasbeleuchtung."]

(*Concluded from p.* 634.)

Experimental Results.

(1) *Hydrogen.*—The hydrogen used in the final experiments was prepared by the electrolytic decomposition of an aqueous solution of caustic potash, and consisted on the average of 98·9 per cent. of actual hydrogen and 1·1 per cent. of air. A mixture of hydrogen and air at 62·6° Fahr., containing 1·9 per cent. of water vapour, did not explode when it contained 9·4 per cent. or less, or 66·5 per cent. or more, of hydrogen. The highest and lowest percentages of hydrogen with which explosion was obtained were 9·5 and 66·3; hence the explosive limits were 9·45 and 66·4 per cent. of hydrogen. These values were (like those subsequently given for other gases, when not expressly stated otherwise) obtained under the already mentioned experimental conditions—*i.e.*, by spark ignition of the mixture contained in a burette 19 mm. wide and of 110 c.c. capacity. Values found by other observers are:

Observer.	Wagner.	Broockmann.	Clowes.	Bunte and Roskowski.	Le Chatelier and Boudouard.
Lower limit . .	8·0	7·0	5·0	9·35	10·0
Upper limit . .	55·0	75·0	72·0	64·85	—

The total want of concordance in the results is to be attributed to the different experimental conditions, and perhaps also to the more or less high degree of purity of the gas used by the different observers. It has already been stated that the author obtained different values—*i.e.*, 8·7 and 75·5 per cent.—for the two limits when using a 1 litre spherical vessel.

(2) *Carbonic Oxide.*—This gas was prepared by heating oxalic acid with concentrated sulphuric acid, removing the carbonic acid also formed, and washing the gas with solution of caustic potash. The gas so prepared consisted of 99·1 per cent. of carbonic oxide and 0·9 per cent. of unexplodable residue. A mixture of carbonic oxide and air at 77° Fahr., containing 3·1 per cent. of water vapour, did not explode when it contained 16·4 per cent. or less, or 75·1 per cent. or more, of carbonic oxide. The limits of the explosive field were 16·5 and 74·95 per cent. of the gas. Other investigators had found the following limits:

Observer.	Wagner.	Clowes.	Bunte and Roskowski.	Le Chatelier and Boudouard.
Lower limit . . .	15·5	13	14·2	16
Upper limit . . .	77·5	75	74·7	—

The differences, though considerable, are not so marked as in the case of hydrogen.

(3) *Water Gas.*—For this purpose, the water gas was compounded of equal volumes of hydrogen and carbonic oxide, and actually contained, on the average, 49·2 per cent. of the former and 49·8 per cent. of the latter, with 1 per cent. of air. A mixture of water gas and air at 65° Fahr., containing 2·1 per cent. of water vapour, did not explode when it contained 12·3 per cent. or less, or 66·9 per cent. or more, of water gas. The limits of the explosive field were 12·4 and 66·75 per cent. of the gas.

According to Le Chatelier, a simple relation subsists between the lower explosion limits of single gases and of their mixtures, expressed by the equation

$$\frac{n}{N} + \frac{n'}{N'} = 1$$

in which n and n′ are the percentages of combustible gas in the mixture at the lower limit of explosibility, and N and N′ the corresponding limits of the separate gases. This equation signifies that any combustible gas, when in admixture with another, furnishes that volume of explosive mixture of gas and air which it would furnish by itself. But later Le Chatelier and Boudouard showed that mixtures of carbonic oxide and hydrogen, in admixture with air, did not strictly obey this law. The deviations from it become greater the more nearly the ratio of hydrogen to carbonic oxide approaches the value 1 : 1, when the equation gives values between 1 and 1·04. On applying the equation to the data obtained in this research—that is to say, making $n + n' = 12{\cdot}4$, $n = n' = 6{\cdot}2$, $N = 9{\cdot}45$, and $N' = 16{\cdot}5$—then

$$\frac{n}{N} + \frac{n'}{N'} = \frac{6{\cdot}2}{9{\cdot}45} + \frac{6{\cdot}2}{16{\cdot}5} = 1{\cdot}032.$$

This result supports the observation of Le Chatelier and Boudouard. Thus the lower limit for the water-gas mixture is rather higher than would be expected from the limits of the separate gases. On applying the equation to the values for the upper limit (at which, however, it cannot be expected to apply quite correctly) —that is, making $n + n' = 66{\cdot}8$, or $n = n' = 33{\cdot}4$, and $N = 66{\cdot}4$ and $N' = 74{\cdot}95$—then

$$\frac{33{\cdot}4}{66{\cdot}4} + \frac{33{\cdot}4}{74{\cdot}95} = 0{\cdot}949.$$

This result shows that the upper limit for the water-gas mixture is lower than would be calculated from the limits of the separate gases. Thus the explosion field of the water-gas mixture is restricted at both limits.

(4) *Marsh Gas.*—This gas was made in two ways. The first was the usual one of heating fused sodium acetate in an iron retort with excess of soda-lime, and purifying the product by means of fuming sulphuric acid, feebly glowing cupric oxide, and caustic potash. The second was the decomposition of powdered aluminium carbide with water. This reaction needed careful control; and as small quantities of hydrogen and other impurities resulted, the gas was passed over glowing cupric oxide and through a solution of caustic potash. This second method of production seemed the most suitable. The gas obtained consisted of 99·5 per cent. of marsh gas and 0·5 per cent. of air.

A mixture of marsh gas and air at 68° Fahr., containing 2·3 per cent. of water vapour, did not explode when it contained 6 per cent. or less, or 12·9 per cent. or more, of marsh gas. The limits of the explosive field were 6·1 and 12·8 per cent. of the gas. Other observers had found the following results:—

Observer.	Wagner.	Brcockmann.	Clowes.	Bunte and Roskowski.	Le Chatelier and Boudouard.
Lower limit . .	6·1	5·5	5·0	5·85	6·0
Upper limit . .	13·4	13·5	13·0	13·10	—

There is evidently much better concordance of results here than in the cases of hydrogen and carbonic oxide.

(5) *Ethylene.*—This gas was obtained from alcohol by heating with concentrated sulphuric acid, and purifying by washing in turn with sulphuric acid and a solution of caustic potash. It was stored over strong brine, and contained on the average 1·4 per cent. of air. A mixture of ethylene and air at 62·6° Fahr., containing 1·9 per cent. of water vapour, did not explode when it contained 4 per cent. or less, or 14·7 per cent. or more, of

ethylene. The limits of the explosive field were 4·1 and 14·6 per cent. of the gas. Earlier observers had found—

Observer.	Wagner.	Clowes.
Lower limit	3·5	4
Upper limit	11·8	22

The upper limit given by Clowes is very high, probably because he ignited the mixture by flame from below. Under these conditions, the author found 20·6 as the upper limit.

(6) *Coal Gas.*—The gas used on two different occasions had the following percentage compositions:—

Description of Gas.	1.	2.
Hydrogen	50·7	50·8
Marsh gas	34·6	34·0
Carbonic oxide	7·1	7·0
Heavy hydrocarbons	4·3	4·2
Carbonic acid	2·1	1·8
Residual nitrogen	1·2	2·2

A mixture of such coal gas and air at 58·1° Fahr., containing 1·6 per cent. of water vapour, did not explode when it contained 7·8 per cent. or less, or 19·2 per cent. or more, of coal gas. The limits of the explosive field were 7·9 and 19·1 per cent. of the gas. Other observers had found the following results with coal gas of other origin:—

Observer.	Wagner.	Broockmann.	Clowes.	Bunte and Roskowski.	Le Chatelier and Boudouard.
Lower limit . .	7·4	4·5	5·0	6·85	8·1
Upper limit . .	18·4	30·0	28·0	22·80	—

Apart from the results of Clowes and Broockmann, there is fair agreement, in view of the variable composition of coal gas.

If the formula of Le Chatelier, referred to in connection with water gas, is extended to apply to a mixture of several gases instead of only two, and the heavy hydrocarbons are assumed to consist of equal volumes of ethylene and benzene vapour, then, taking the mean of the two analyses quoted above, the formula will give:

$$\frac{n}{N}+\frac{n'}{N'}+\frac{n''}{N''}+\frac{n'''}{N'''}+\frac{n''''}{N''''}=1{\cdot}007$$

Thus Le Chatelier's law is, in its general form, applicable to a mixture of a large number of combustible gases and vapours.

(7) *Acetylene.*—This gas was made from Bitterfeld calcium carbide, and purified by passing it through bromine water and a solution of caustic potash. It was stored over strong brine, and on analysis was found to contain 1 per cent. of other gas. A mixture of acetylene and air at 62·6° Fahr., containing 1·9 per cent. of water vapour, did not explode when it contained 3·2 per cent. or less, or 52·4 per cent. or more, of acetylene. The limits of the explosive field were 3·35 and 52·3 per cent. of the gas. Earlier observers had found very different values, especially for the upper limit. Thus Clowes had found the limits to be 3 and 82; Le Chatelier, 2·8 and 65; and Pantotovic, 4·8 and 49·4. Hence some tests were made to ascertain the effect on the results of varying the size of the vessel in which the mixture was exploded. They were as follows:—

In a 100 c.c. Hempel explosion pipette, spark ignition exploded mixtures containing 4 to 50 per cent. of acetylene.

In a cylinder 18 mm. wide, bunsen flame ignition exploded mixtures containing up to 60 per cent. of acetylene.

In a cylinder 44 mm. wide, 400 c.c. capacity, bunsen flame ignition, from above, exploded mixtures containing up to 60 per cent. of acetylene.

In a cylinder 100 mm. wide, 1000 c.c. capacity, bunsen flame ignition, from above, exploded mixtures containing up to 70 per cent. of acetylene.

In a cylinder 122 mm. wide, 2500 c.c. capacity, bunsen flame ignition, from above, exploded mixtures containing up to 75 per cent. of acetylene.

In india-rubber balloons, 2000 c.c. capacity, bunsen flame ignition, exploded mixtures containing up to 75 per cent. of acetylene.

Some tests were next made at higher temperatures than the ordinary, with the following results:—

In a cylinder, 44 mm. wide, 400 c.c. capacity, heated in an air bath to 392° Fahr., bunsen-flame ignition from above exploded mixtures containing up to 75 per cent. of acetylene.

Mixtures passed through a glass tube, 10 mm. in diameter, heated to a given temperature, behaved, when ignited by spark, as follows:—

A mixture containing 52 per cent. of acetylene (not explosive at ordinary temperatures) exploded at 392° Fahr.

A mixture containing 54 per cent. of acetylene did not explode even at 750° Fahr.

A mixture containing 52 per cent. of acetylene, in the presence of copper, exploded, without the passage of the spark, at 700° Fahr., doubtless owing to the intermediate formation of copper acetylide.

It is worthy of note that in these tube tests, the explosion did not extend beyond the heated portion of the tube. The results show, generally, that while the size of the vessel has a very marked influence on the upper limit, increase of temperature acts in the same direction, but in a less degree.

(8) *Benzene Vapour.*—The researches with combustible vapours were made by allowing a measured or weighed quantity of the substance to evaporate into a known volume of air sealed over mercury. The increase of volume gave directly the quantity of vapour added, which could also be calculated from the quantity of the substance taken. The mixture of air and vapour so obtained could be treated as a combustible gas—due regard, however, being paid to the high solubility of the vapour in water. The volume of vapour present in the samples was also checked by analysis.

The benzene used boiled at 178° to 181½° Fahr. The mixture of benzene vapour and air was stored over mercury, with a few drops of water in order to ensure its being saturated with water vapour. The mixture at 59° Fahr., containing 1·6 per cent. of water vapour, did not explode when it contained 2·6 per cent. or less, or 6·7 per cent. or more of benzene vapour. The limits of the explosive field were 2·65 and 6·5 per cent. of that vapour. Le Chatelier and Boudouard found 1·5, and Kubierschky 1·4, as the lower explosion limit. It was found on investigation that this difference was doubtless due to the difference in size of the containing vessels used. Mixtures containing only 1·5 per cent. of benzene vapour exploded in a litre cylinder 62 mm. in diameter, when ignited by a flame from above; but when containing only 1·3 per cent., they did not explode. A 1·4 per cent. mixture exploded, while a 1·2 per cent. one did not, in a glass sphere of 14½ litres capacity. These differences in the lower limit found under varying conditions, indicate the effect of the cooling action of the walls of the containing vessel.

(9) *Pentane Vapour.*—The pentane used, prepared by fractional distillation of gasoline, boiled between 98½° and 107½° Fahr. The mixture of pentane vapour and air, at 50° Fahr., containing 1·2 per cent. of water vapour, did not explode when it contained 2·3 per cent. or less, or 5 per cent. or more, of pentane vapour. The limits of the explosive field were 2·4 and 4·9 per cent. of the vapour. In a litre cylinder, a 1·4 per cent. mixture exploded, while a 1·2 per cent. one did not; and in the 14½ litre sphere, a 1·3 per cent. mixture exploded, while a 1 per cent. one did not. Le Chatelier and Boudouard give 1·1 per cent. as the lower limit of explosion.

(10) *Benzoline Vapour.*—The benzoline used was that portion of commercial benzoline which distilled over up to 221° Fahr. The mixture of benzoline vapour and air, at 51° Fahr., containing 1·3 per cent. of water vapour, did not explode when it contained 2·3 per cent. or less, or 5 per cent. or more, of benzoline vapour, just as with the pentane mixture. In a litre cylinder, a 1·2 per cent. mixture exploded, while a 1 per cent. one did not.

(11) *Ether Vapour,*—The mixture of ether vapour from ethylic ether and air at 71·6° Fahr., containing 2·6 per cent. of water vapour, did not explode when it contained 2·7 per cent. or less, or 7·9 per cent. or more, of ether vapour. The limits of the explosive field were 2·75 and 7·7 per cent. of the vapour. In a litre cylinder, a 1·7 per cent. mixture exploded, while a 1·5 per cent. one did not. Le Chatelier and Boudouard give 1·9 per cent. as the lower limit.

(12) *Alcohol Vapour.*—Though alcohol gives an explosive mixture of its vapour with air at ordinary temperatures, it is not sufficiently volatile for the higher limit to be reached under such conditions; hence the researches on it had to be conducted at higher temperatures. The alcohol used had a specific gravity of ·8088 at 59° Fahr., corresponding to a proportion of 95·14 per cent. of ethyl alcohol contained in it. The tests were actually made by saturating air with the vapour at different temperatures, and calculating (from Regnault's figures for the tension of alcohol vapour at the temperatures in question) the percentage of vapour present in the mixture. It was thus found that a mixture of alcohol vapour and air did not explode when it contained 3·97 per cent. or less, or 13·7 per cent. or more, of alcohol vapour. The limits of the explosive field were 3·95 and 13·65 per cent. of that vapour. In a litre cylinder, a 3·6 per cent. mixture did not explode, while a 3·8 per cent. one did. Le Chatelier and Boudouard had found 3·07 per cent. for the lower limit.

Summary.

The figures found in the experiments made in the Bunte burette are tabulated, and thus give Table I., shown by Dr. Bunte in the course of his lecture on "Explosive Gas Mixtures," given in the "Journal" for Dec. 24 and 31 last. Table I. was given in full on p. 1661, and on the same page is Table II., comprising the values deduced from the results recorded in Table I. The next table given by the author shows the percentages of air, combustible gas, and water vapour in the mixtures at the two explosive limits; and then follows a table giving the proportions in the mixture of combustible gas and air. The greater part of this table was included in Table III. on p. 1662 of the last volume of the "Journal." The author also gives a diagram, which is substantially the same as Diagram I. on page 1661 showing graphically the extent and position of the explosion field for each mixture.

The author remarks that the explosion field, or range of explosibility, as determined by him for each mixture, is more restricted than when the explosion is made in a wider vessel than the Bunte burette, owing to the cooling influence of the walls of the burette. The results as a whole, however, are not greatly affected, and they have a practical as well as a theoretical value. In the first place, they afford a criterion of the danger of explosion; so that steps may be taken to avoid it. They give a basis for drawing up sets of precautionary rules for the manipulation of gas apparatus, and the application of readily volatile combustible liquids.

The great differences in the extent of the explosion field in the

case of different gases are very evident. They are primarily dependent on the differences in the volume of oxygen required for the complete combustion of the combustible gas or vapour. The greater this consumption of oxygen, the greater, generally speaking, is the heat produced by the combustion, and consequently the less is the amount of combustible gas required to make the mixture explosive. The quantities of detonating gas in the explosive mixtures differ far less than the proportion of combustible gas present, as will be seen by reference to Table III. already mentioned. At the upper limit, the combustion is incomplete, except in the cases of hydrogen and carbonic oxide.

In conclusion, the subjoined table shows the lower explosion limits, as determined by the author, when the mixture was contained in a cylinder 62 mm. (2½ inches) wide, and ignited by flame from above. The gases were saturated with aqueous vapour.

	Per Cent.
Hydrogen	8·5
Water gas	12·3
Ethylene	3·4
Marsh gas	6·3
Ether vapour	1·6
Benzene vapour	1·4
Pentane vapour	1·3
Benzoline vapour	1·1
Alcohol vapour	3·7

The author proposes to deal exhaustively with the theoretical bearing of the results of his present researches in a subsequent communication.

COTHIAS CASTINGS FOR GAS-FITTINGS AND METER PARTS.

In the making of gas-fittings, the mechanism of gas-meters, and many other things connected with the supply of gas, there is a great deal of repetition work, which offers scope for effecting economies in production. La Société Anonyme des Alliages Cothias (whose London agents are Messrs. Norman and Young, 36, Camomile Street) claim that they are able, by their series of white metal alloys, and by their system of casting, to save gas-fittings, meter, and other manufacturers time and labour; and this means money. The fact that two of the largest meter manufacturers of Paris have placed substantial orders with the Company for castings, that they number among their English customers Metropolitan Gas-Meters, Limited, and that other makers of gas-works supplies are looking into the matter of the adoption of the Cothias castings is a guarantee that there is truth in these claims. Into the composition of these hard white metal alloys (which take their name from their discoverer, who is a French engineer), zinc enters to a certain extent. Of the lightness of the alloys, we can speak; and of their high tensile strength and wearing powers we are assured. They are cast in metal moulds; and from these they issue in a highly finished state—smooth and clean—and quite ready for fitting, so that the necessity for perfecting machinery is obviated. Anything that has hitherto been cast in brass, and afterwards finished can be produced in the one operation by this system. All holes and threads are cast in the process, angles are clearly defined, and there is an unfailing equality in dimensions between the pieces. Three parts of a prepayment meter—a platform base, a coin tube, and a plunger—have been submitted to our inspection, and certainly, so far as finish goes, nothing better could be obtained or could be required. The alloys can be polished, nickelled, brassed, coppered, silvered, or gilded. At the works of the Company at Ivry-Port, near Paris, there are some 150 men employed constantly, and more when there is pressure; and this is evidence of an extensive use. It is proposed, if the castings have a good demand in this country (which we fancy they will have), to lay down a foundry here for their production.

Husbanding Coal Resources by Means of Water Gas.—The following views have been expressed by Dr. Mechner in the course of a pamphlet written by him on the coal question: It seems possible to lessen the troublesome and expensive transport of coal by erecting gas-works at or near the collieries. The gas could be led by means of pipes to the places where it is to be used. The great expenses necessary in consequence of the handling of coal would thus be avoided. Furthermore, by building large gas-works at the pit's mouth, the working could be made less expensive by utilizing the surplus heat for driving the colliery winding-engines. The necessary system of gas-mains from the colliery works to the towns would not entail a large outlay, because, as the water gas does not freeze, the pipes need not be placed underground. Furthermore, variations in level of the intervening country would not cause trouble, as gas can be distributed to places at either a lower or a higher level than the works by a very small expenditure of power, as gas engineers know quite well. The rate at which the gas passes through the pipes could be as high as 70 feet per second. Dr. Mechner admits that all these technical advantages have been known for a long time, as forty years ago a scheme for supplying water gas by pipes from Fürstenwalde (a place 31 miles distant) to Berlin was brought forward. Among the many advantages which would follow the use of gas in factories and houses instead of coal is, of course, the gain from a hygienic point of view, which would ensue from the abatement of the smoke nuisance in towns.

THE LUCAS HIGH-PRESSURE GAS-LIGHT.

The following is the substance of a paper, on the "Lucas Light," read by Herr Ebner, of Berlin, at the last annual meeting of the Bavarian Union of Gas and Water Engineers.

The special form and construction of the lamp give rise to the supposition that some physical process must take place in it, resulting in the great power of the light of this burner. This is, in fact, the case, since the Lucas burner works with a mixture of air and gas not previously attained in the burner industry. Even if one started with the correct idea, said the author, that a better proportioned mixture of gas and air was necessary to obtain a stronger light with an incandescent mantle, the results attained were far behind the Lucas lamp. The inventor of the latter achieved his results solely by a combination of the most simple elements. He attached a very long and wide mixing-tube, almost hermetically, to a very long chimney, and thereby attained the result which can be observed in the present lamps.

Since the time of Welsbach's invention, experts have been endeavouring to construct gas-burners, giving high lighting effects; but a number of these proved to be inefficient, and only Greyson de Schodt and Denayrouze have, he said, produced anything perfect. Even these two have not succeeded in producing in their burners a mixture of air and gas nearly approaching an explosive mixture, and conducing to a high power of light. The inventor of the Lucas light discovered that the flame of a bunsen burner has the most intensive effect on a mantle if about six parts of air be added to the gas before combustion. The burners of Greyson de Schodt and Denayrouze only produce a mixture of 1:4, reduced when the mantles are put in position to 1:3 or 1:3½. For perfect combustion of the gas, 6 volumes of air are required; and in burners other than the Lucas, external air was used—that is, air which passed to the flame from outside, and not through the mixing-pipe. The result was that the mantle never attained the full intensity of light, and a favourable consumption of gas could not take place. To obtain high lighting effects, the external air must be dispensed with, and such a quantity of air must be added to the gas, before combustion, in the mixing-pipe, as corresponds to a proportion of 1 : 6 in the mantle flame.

These proportions were not attainable, said Herr Ebner, with the ordinary gas pressure and the present burners. They constitute, as is well known, the detonating gas mixture, which, however, cannot be used for incandescent lighting without auxiliary means. The detonating gas-flame is very short; and the propagation of the explosion is very rapid. This ratio of admixture would not suffice by itself; and it was necessary to make the rate of outflow of the gas and air mixture greater than the rate of propagation of the explosion. This is accomplished by the great draught caused by the lengthened chimney.

The air required to form the detonating gas mixture amounts—with the 18·4 cubic feet of gas which pass out of the Lucas lamp per hour—to at least 110 cubic feet. In reality, however (as measurements have proved), about 155½ cubic feet of air per hour are forced through the mixing-pipe—corresponding to a proportion of 1 : 8·4. The Lucas lamp thus, with its high lighting effect and economical working, becomes a competitor with the electric arc light. Berlin has, as most people are aware, begun by lighting a portion of the Friedrichstrasse with the Lucas lamp; and the results obtained there have already induced other places to follow suit.

CLEANSING AND PRESERVING BOILERS.

The cleansing and preservation of boilers is a subject, in view of their extensive use in gas and water works, upon which no excuse is needed for devoting a little space. Like engineers in other walks of the profession, the gas and water engineer has had his experience of the loss and inconvenience caused by that vexatious nuisance—incrustation. Compositions which have the blessed virtue attributed to them of being able to deliver him from the oppression of this foe are offered to him; but in many cases it is found that the material is not a panacea—it may be effective in some instances, but not in all. Water differs so materially in its soluble and solid constituents that, so experiment we are informed proves, it is utterly impossible for one given kind of material to produce a uniformly successful or universal result. This being so, it is interesting to come across a process which has been proved successful in such widely separated parts of the globe as Buenos Ayres and this country—in both over large railway systems, where waters differing considerably in their constituents are constantly in use in the locomotives. Particulars of this process were forwarded to us by the Imperial Cleansing and Preserving Company, of 29, Maltby Road, Bermondsey; and, before noticing it, we made a little inquiry on our own behalf. The first proof offered of the efficacy of the material in accomplishing what is claimed for it were small slabs of thick obdurate scale that had, by the persuasion of the Imperial Company's process, been induced to leave the interior of a locomotive boiler in as clean a way as anything we have yet seen; and what can be done in a locomotive boiler can be effected equally well in a stationary boiler. Some reports of railway engineers were also put into our possession; and we find them full of commendation. The material, which is so highly spoken of, is a combination of vegetable substances, containing properties which, while it will

successfully remove incrustation, will also, we have been assured, after cleansing, prevent its further formation, without any deleterious action either on the plates or fittings of the boiler. Mention of this reminds us that, in one of the reports, the Locomotive Superintendent of an Argentine Railway (on which the material is extensively employed) gives the information that he has used what is called the anti-priming and anti-incrustant composition steadily on the railway since 1892, during which period the engines have run 20 million miles; and throughout he has not detected the "slightest sign of damage" as the result of its use.

The material is made to suit the varying constituents of the water most commonly used, or of any special kind, in conjunction with any class of boiler or pressure used; and, to this end, the makers divide the composition into three classes—(1) "Disincrustant; (2) "Anti-incrustant;" and (3) "Anti-galvanic." The first preparation, after a few days' use, not only precipitates the carbonates of lime, but also holds in suspension the sulphates of lime which form at a higher temperature, thus leaving the plates free of all calcic matter. The second preparation prevents the cohesion of the calcareous matter set at liberty by neutralizing its cementing properties, and precipitates it to the bottom of the boiler in molecules, from whence it can be washed out at the first opportunity. The action of the third material is to neutralize the effect of the galvanic currents which are so often found in certain classes of boilers and condensers where copper and iron are brought in contact. The material can be introduced with the feed water or through the safety-valve holes, or any other convenient opening, dissolving the powder first in a bucket of water.

Of course, it depends upon the size of the stationary boilers how much of the material is required to accomplish its purpose; but from four to six 2-lb. tins will, we are told, suffice in most cases, and each tin costs about 3s. It will be seen by this that a great saving can be effected by this method in comparison with hand labour. The proof is to be found in its trial, and so we cannot refrain from repeating an offer made at the time we were inquiring into this material, that the Company would be pleased to forward to interested readers a few tins for experimeut. Abundant justification for what we have said here is found in the reports previously referred to. One engineer asserts that, by using the material, his boilers are maintained in a perfectly healthy condition; and the consumption of fuel has in consequence been somewhat reduced. Another report gives the details of an interesting test of a badly affected boiler on one of our leading railways; and this test is convincing.

A SELF-ACTING COMBINED GENERATOR AND GAS-ENGINE PLANT.

Herr H. Neumann, of Cologne-Deutz, has lately written an interesting paper on a "New Method of Making Producer Gas for Motor Purposes." The following is an abstract translation of his communication, which has been published in a recent number of "Der Gastechniker."

It is generally known that producer gas for motor purposes is made in Dowson or generator-gas plants by blowing a mixture of steam and air underneath the grate of a furnace filled with incandescent anthracite or coke. The gas, after purification and cooling, is passed into a small holder, and thence to the motor. As the working of a gas-motor with producer gas is effected without waste in the consumption of fuel, these plants enter very successfully into competition with large steam-engine installations. The working results of two electrical plants—one using producer gas and the other steam, and both engines being nearly of the same size, and indicating 100-horse power—showed that by employing generator gas 1 lb. of fuel produced about 0·3-0·4 kilowatt per hour; while working with steam only generated about 0·1-0·2 kilowatt per hour. The considerable cost of the gas plants, however, the continuous attention required, and the amount of space needed for the boiler and gasholder, prevented their being adopted for small power installations.

But all these obstacles have been removed by the so-called "suction generator-gas plant." The motor itself sucks a mixture of steam and air into the generator, to produce the gas; the required steam being obtained from an evaporator in the cover of the generator. The steam has a cooling action on the grate, and gives the gas a higher heating power. Besides the producer, only a small purifier—connected to the motor—is necessary to complete the plant. It is therefore exceedingly simple. The generator need not be filled more than twice a day; and, moreover, the grate can be safely cleaned during the working of the plant.

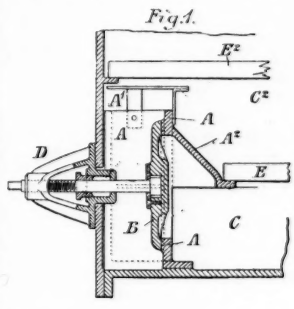
While in small steam installations, the efficient or brake-horse power per hour requires at least 7 lbs. of coal, and sometimes even more, in a good Otto-motor working with suction generator-gas, 1-horse power is obtained from 1·2 lbs. of anthracite per hour. Every particle of coal which goes into the generator is turned into gas; and no fuel is wasted, as is the case when there is a smoking chimney.

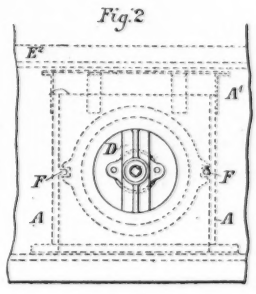
Comparing the electro motor, coal-gas motor, and suction generator-gas motor with regard to their consumption of fuel—assuming 2½d. as the price for current per kilowatt hour, 2s. 10d. as the price of coal gas per 1000 cubic feet, and £1 10s. per ton as the price of anthracite—the effective horse power per hour will cost about 2½d. in the electro motor, ½d. in the coal-gas motor, and ¼d. in the suction generator-gas motor.

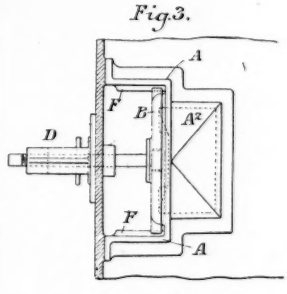
REGISTER OF PATENTS.

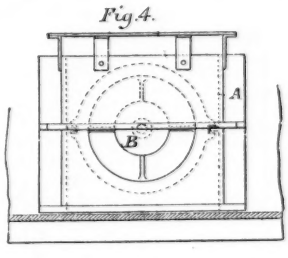
Gas-Purifier Valves.—Milbourne, R. J., of Wellington, Salop. No. 11,355; June 3, 1901.

The object of this invention is "to provide gas-purifiers with a valvular arrangement which can be operated to enable any tier or tiers of purifying material to be bye-passed."









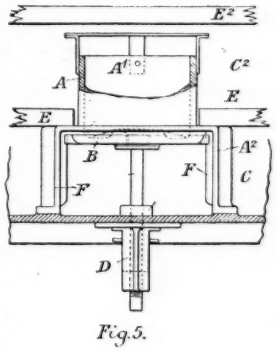


Fig.5.

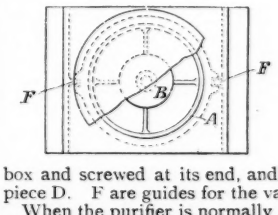


Fig. 1 is a vertical section showing the arrangement as worked from the side. Fig. 2 is an elevation of part of the side plate of a purifier where the valvular arrangement is applied. Fig. 3 is a plan of the valvular arrangement with the hood removed. Fig. 4 is an elevation of the valve, from inside the purifier. Fig. 5 is an elevation and plan of a modification adapted to be worked from underneath the purifier.

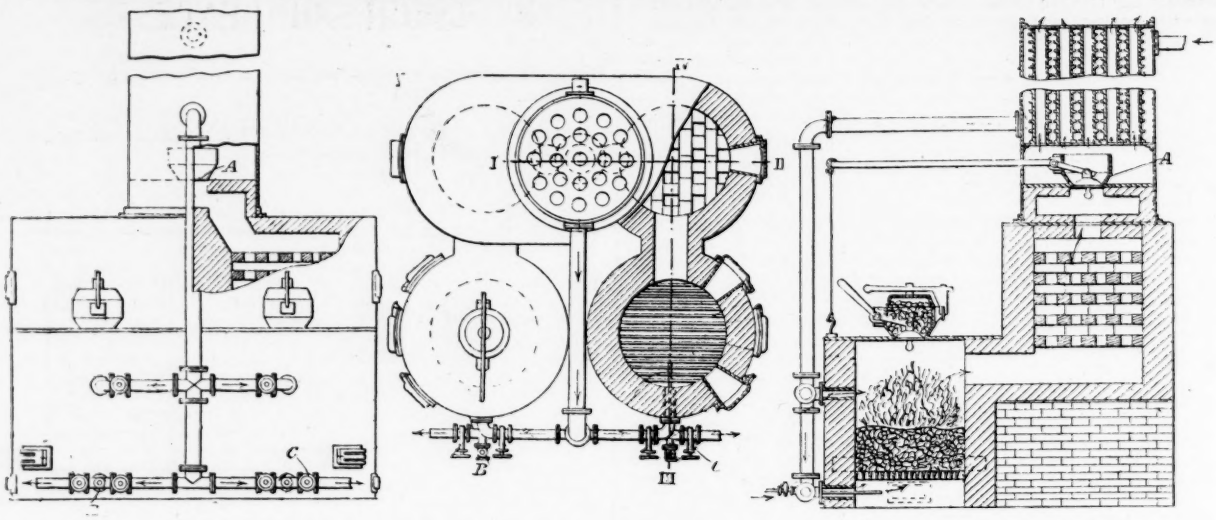
In figs. 1 to 4, the valve-box A is attached to the side (or side and bottom) of the purifier, which is shown as splayed out at A^2 to give free passage for the gas. The front of the valve-box has in it an opening surrounded by a valve-seating against which a disc-valve B can be closed. The opening communicates with the lower division C of the purifier, while the valve-box at the top A^1 opens into the division C^2 above; the opening being shielded above by a hood to protect it from the purifying material. The disc-valve B can be operated by a spindle passing through a stuffing-box and screwed at its end, and working in a screw-nut in a bridge-piece D. F are guides for the valve.

When the purifier is normally at work, the valve is closed (as shown), and the gas passes up through the purifying material on the tray E; but when the material becomes fouled, the valve is opened, and the gas passes through the casing A, and by the opening A^1, to beneath the tray E^2 of purifying material above.

When the valve is arranged to be operated from beneath the purifier, the casing A is in the form of a short pipe open top and bottom, and with the valve seating around its lower opening—being mounted upon supports provided with the guides F for the valve.

Manufacture of Water Gas.—Kramers, J. C. H., of Mastricht, and Harts, J. G., of Dongen, bie Breda, Holland. No. 2750; Feb. 8, 1901.

This invention relates to water-gas generators (in pairs), arranged side by side, and each communicating with a regenerator, preferably placed behind and above the generator. The two regenerators open at the top into a common chamber, above which is an economizer; communication between the chamber and the economizer being controlled by a valve. Air for supplying the generators is blown through the economizer, where it is heated by passing around a number of tubes conveying the waste gases to the atmosphere. The main pipe conducting this air has four branches—two supplying air to each generator, one above the fuel and the other below it. Suitable valves control these four branches. Steam-pipes enter the generators below the fire-bars, and pipes are provided, controlled by suitable valves, for conducting the water gas from the same place. On each generator is a charging hopper for fuel.



The apparatus works as follows: After the hot blow, both generators being in use with the valve A and all the air-valves open, the surface of the fuel in one generator (say 1) is covered with coal from the hopper The valve A and the air-valves are now closed, and the steam cock B is opened; steam being admitted under the fire-bars. The steam is thus decomposed and water gas is produced, which, when it arrives at the freshly-added layer of coal, has a temperature high enough to gasify the coal partly; so that a mixture of water gas with heavy and light hydrocarbons is the result. This mixture passes through the regenerators 3 and 4, and downwards through the red-hot fuel in generator 2, Here the hydrocarbons are converted into hydrogen and carbon monoxide, and a part of the ammonia is decomposed into nitrogen and hydrogen. The water gas leaves the generator 2 through the valve C, and passes to the purifiers. When the temperature in the generators and regenerators has fallen too low, the steam-cock B and the valve C are closed, while the other valves are opened, and a hot-blow follows.

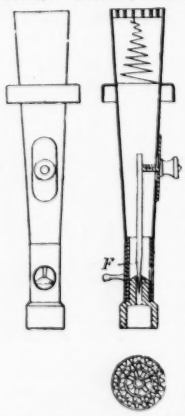
During the gas-making period, the blast remains in action, so that a certain pressure is maintained in the air-supply pipes which is about equal to that in the gas-mains, and is observed by means of a manometer. The object of this is that water gas shall not leak through the valves and form an explosive mixture with the air.

The height of the column of fuel in the apparatus is not great, so that any kind of fuel may be used—such as coke, hard coal, brown coal, or refuse containing carbon; and combustion to carbon dioxide is possible without great speed of air-blast. The dimensions of the generators may be small, so that the quantity of nitrogen and carbon dioxide left in the apparatus when the change is made from the hot-blow to gas making, is proportionately small, and the water gas is only a little contaminated by these gases.

The apparatus is also applicable for the manufacture of semi-water gas—a mixture of nitrogen, hydrogen, and carbon monoxide, for heating purposes and for power. The hot-blow and the regenerators 3 and 4 are in this case omitted; and during the gas making a mixture of steam and air, instead of steam alone, is blown into the generator in use. The gas produced flows downwards through the column of red-hot fuel in the second generator, and is then passed successively through an economizer and a preliminary air-heater, finally arriving at the purifiers in a properly cooled condition. In the economizer, the mixture of steam and air is heated before it is admitted to the generator; while the air drawn in by the steam-injector is heated in the preliminary heater before it comes in contact with the steam—the heating being on the counter current principle.

Gas-Burners.—Durban, W. L., of South Tottenham. No. 5892; March 20, 1901.

This burner consists of a mixing and heating chamber (for the gas and air) more or less in the form of an inverted truncated cone, provided inside, if desired, with a radiator for the heat, consisting of a helical or other coil of wire, or of a number of vertical rods, strips, or the like. The chamber (made of some good heat-conducting metal) has, at the lower part, an aperture for the inlet of air, fitted with a sleeve mounted in such manner as to permit of the hole to the mixing-chamber being closed more or less. The sleeve is provided with a handle to permit of motion being communicated to it. The amount of gas passing is regulated by a valve F in the mixing-chamber—preferably made in the form of a needle-valve, as shown. The needle is provided with a seating on a level with the air-supply hole; and the valve is made with a stem and handle projecting through a slot in the heating-chamber, covered with a curved washer or plate so as to prevent the escape of the gas and air mixture. In order to fix the valve F in position, the handle is screwed up or down, or there is a rack on the stem of the valve, which is suitably guided inside the mixing-chamber, and a shaft or spindle is mounted in bearings in the mixing-chamber, and projecting outside of it, with a handle outside, and having a pinion fixed on the shaft in the chamber, which gears with the rack on the valve-stem.



The burner proper consists of wire gauze across the top of the mixing chamber; or (as shown) a number of pieces of flat metal ribbon are bent in between the walls of the mixing-chamber and concentric rings as shown, which ribbon and rings serve to convey heat from the flame to the interior of the mixing and heating chamber.

Incandescent Lamps and Burners.—Smith, T. B., of Handsworth. No. 11,787; June 8, 1901.

This invention has reference more particularly to the construction and arrangement of incandescent gas-burner fittings, where it is desired that the burner shall occupy comparatively short vertical space, "so as to allow the whole of the fittings to be enclosed in the glass shade, in order that it may resemble the usual electrical fittings;" also improved means whereby the intensity of the flow of mixed gas and air to the burner may be regulated.

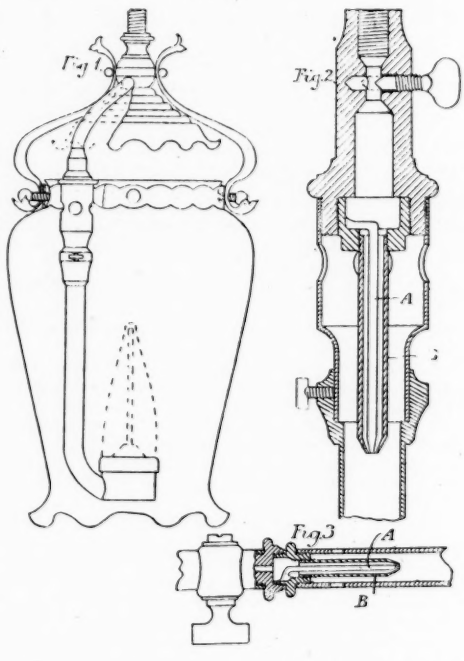


Fig. 1 shows the fitting having an adjustable "force regulater" adapted to suit a suspended glass shade. Fig. 2 is a large sectional view of the means for adjustably regulating the force of gas and air to the burner. Fig. 3 shows the invention in combination with a horizon al arm.

It is found, says the patentee, that where the burner is placed at such a lower level to that of the bunsen portion as, or approximating to, the relative positions shown, there is great difficulty (except under unusual pressures) to get sufficient pressure to mix the gas and air together, and carry them to the burner. To overcome this, in the pipe leading to the burner is placed an intensifier, whose fore end is beyond the air-inlets. This intensifier is constructed as follows: A central fixed rod A is secured at its rear end by being soldered to the socket, or by its end being formed into a circle and held by screw pressure between the socket and the fitting. The forward end of the rod is conical, to agree with the end of the tube B, which latter is adjustably screwed into the socket. Hence, when the tube B is screwed outwards, so as to enlarge the space for the outflow of gas, the pressure or force of flow is reduced; while, on the other hand, the force is increased as the tube is screwed inwards until it is nearly or wholly closed. By this means, with a given pressure on the main, the tube may be adjusted so as to give the proper force to suit the burner; and it there remains a fixture by reason of its being then protected by the outer pipe. Hence, if the fitting be attached to any main whose pres-

sure is equal to, or in excess of, the pressure of the main on which it was first adjusted, the proper force at the burner will be sustained.

APPLICATIONS FOR LETTERS PATENT.

4902.—Dougall, J., and Godwin, A. H., "Condenser-washer." Feb. 26.
4915.—Drake, B. M., Gorham, J. M., and Clerk, D., "Purifying the exhaust gases from internal combustion engines." Feb. 26.
4918.—Daniels, J. S. & F. L., "Purifying gas obtained from gas-producers." Feb. 26.
4964.—Ratcliff, F. W., Pearson, J. H., Morris, W., and Toy, H. B., "Gas-producers." Feb. 27.
4974.—Whitelow, E. T., "Incandescent gas-lamps." Feb. 27.
5052.—Holt, A. & E., "Gas-retorts." Feb. 28.
5053.—Hills, H. G., "Gas producing plant." Feb. 28.
5120.—Melhuish, A. G., "Gas and oil engines." Feb. 28.
5123.—Abraham, A., "Incandescent burners and mantles." Feb. 28.
5187.—Still, C., "Oven for making coke, with recovery of bye-products." March 1.
5188.—The Acme Sunlight Gas Syndicate, Ltd., and Baumgarten, H., "Acetylene gas-generators." March 1.
5201.—Scott-Snell, C., "Incandescent gas-lamps." March 1.
5221.—Potter, W. G., "Intensifying apparatus for use in gas lighting." March 1.
5237.—Tranfield, G. H., "Heating and cooking stoves." March 3.
5280.—Coppin, T., "Motive fluid engines." March 3.
5297.—Meerts, V., "Gas-meters." March 3.
5371.—Godwin, A. H., Dougall, J., and Keil, F. A., "Extraction of the cyanogen group contained in the spent or waste gases given off in the saturator in the process of manufacturing sulphate of ammonia." March 4.
5373.—Gibbons, W. P. & G. B. A., "Elevator and conveyor chains." March 4.
5422.—Wilton, T., "Apparatus for raising and forcing liquids." March 4.
5424.—Gilgan, P., "Acetylene gas generators." March 4.
5440.—Schofield, A., "Dry gas-meters." March 5.
5485.—Gilgan, P., and Browne, F., "Alarm-device for coin-freed gas-meters." March 5.
5493.—Krafft, V., "Air or gas compressors." March 5.
5546.—Hulbert, A. E., "Retort-lids." March 6.
5587.—Wilson, W. G., and Wilson and Pilcher, Ltd., "Explosion engines." March 6.
5719.—Rouet, T., "Cooker." March 7.
5720.—Simpson, W. S., "Gas or oil engines." March 7.
5791.—Thompson, W. P., "Gas-burners." A communication from Lorenz and Co. March 8.
5798.—Scott, A. F., "Gas and other fluid-pressure engines." March 8.

Incandescent Mantle Companies.—The Plaissetty Mantle Syndicate was registered a few days ago, with a capital of £10,000, in £1 shares, to acquire from J. De L. Cohen and W. K. L. Dickson an option granted to them by A. M. Plaissetty and E. Sepulchre for improvements in the manufacture of incandescent filaments and mantles for the United Kingdom and Colonies of Great Britain (excepting Canada). There will be no initial public issue. The Guaranty Incandescent Mantle Company, Limited, has been registered with a capital of £5000, in £1 shares (1500 deferred), to acquire the goodwill of the business of manufacturers, importers, and dealers in gas-mantles, as carried on by J. Stein and E. Schültz as the Guaranty Incandescent Mantle Company; to develop and extend the same; and to carry on business as manufacturers of, and dealers in, all kinds of machinery, apparatus, and appliances adapted for the use or consumption of gas, and gas engineering generally. There will be no initial public issue.

Harrogate and the Knaresborough Water-Works.—At the last monthly meeting of the Harrogate Town Council, Alderman Fortune reported upon the negotiations which have been in progress between the Corporation and the Knaresborough District Council with regard to the acquisition of the Knaresborough Water-Works. He said they had interviewed the Knaresborough Council and arranged the terms, which would be embodied in an agreement which they would ask Parliament to sanction. The Corporation would take over the works as a going concern, and also the debt of the Council upon them; but the Corporation did not claim the mill close to the River Nidd or the filter-beds attached, or an adjacent field. They would take the water-tower and cottage, and the yard attached, and would supply Knaresborough with water at an exactly similar rate to that in force at Harrogate. In reply to a question, Aldeman Fortune said he could guarantee plenty of water, even if the coming summer was as dry as the past had been. The Mayor (Alderman Simpson) remarked that it was a fair and equitable arrangement, and would benefit both towns.

Final Meeting of the Over and Winsford Gas Company.—The undertaking of the above-named Company having been transferred to the Winsford District Council, the final meeting of the Company was held on Monday last week, for the purpose of making the second division of the purchase-money, the amount of which was fixed by Mr. Thomas Newbigging, the Arbitrator, at £15,682. The first division took place a short time ago, when each £1 share brought the holder in 30s. It was decided to pay another 11s. 1d. per share; making £2 1s. 1d. in all. There was a small balance, which was divided equally between the Directors, the Manager (Mr. F. Sidwell), and the workmen. The Company's capital was £8700; and the average dividend of late years had been 8 per cent. Since the Local Authority came into possession, the price of gas has been reduced 3d. per 1000 cubic feet, making it 4s. 1d. net; and for cooking purposes, the charge is 3s. 8d. The Council have also fixed more than 50 cookers, in addition to numerous stoves and grillers. The services of Mr. Sidwell, who was with the Company for fourteen years, and proved a very efficient Manager, have been retained by the Council.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Inclined v. Horizontal Retorts.

Sir,—In reply to Mr. Alexander Wilson's letter in your issue of the 4th inst., I should like to point out that he seems to have lost sight of the fact that 87 per cent. more retorts are required to carbonize the same quantity of coal as the 46 settings of inclines with 414 retorts. This fact explains most of the differences in the number of firemen, cokemen, &c., with horizontals.

There are 87 per cent. more generators to attend to; and although the quantity of coke to be handled is identical in both cases, there is a proportionately larger number of barrows to be shifted and wheeled away. Mr. Wilson's installation must be very favourably circumstanced to be able to work with so few men. The retorts must be higher; the heats are probably lower; and the coal—probably Scotch shale—must give a coke which does not cake, and cannot have the slightest tendency to form thick tar.

Of course, if the pipes do not require regular auguring, the necessity for pipe-jumpers falls away; but that is not our experience on the Continent. Employing exactly the same description of coals, with horizontals and inclines—chiefly Durham coals, such as are used on most English gas-works, and working with the same heats, and charging every 4 hrs. 48 mins.—it has been found that the ascension-pipes on the horizontal system require great attention, whereas those of the inclined retorts hardly get stopped up at all; and this undoubted fact can certainly be put to the credit of the inclines. The arrangement and size of ascension-pipes is exactly the same in both cases. Therefore, the number of all these being 87 per cent. more, so it is with every other detail of work: 414 retorts × 5 = 2070 charges have to be made with inclines, and 774 × 5 = 3870 charges with horizontals.

Admitting, therefore, Mr. Wilson's figures as regards the machine hands and helpers necessary, but keeping our number of pipe-jumpers, lidmen, &c., and keeping also the item for the hot-coke conveyor, for purposes of comparison, the number of men required would be 109 for horizontals, as against 78 for inclines in 24 hours; or a cost of 10·45d. per ton as against 8·56d. Therefore the number of men required under the most favourable circumstances, and with hot-coke conveyors, is 40 per cent. more for horizontals and stoking machinery, and the cost about 2d. per ton more.

Mr. Wilson gives eight pipemen only as necessary. This is only four men per shift for 774 retorts. All other men are so carefully calculated that they have not a moment to spare to lift a hand for anything else; and, in case of a breakdown (say) only for a few hours or in the night, where would the reserve men come from? With inclines, there is nothing to get out of order; neither is the number of men in comparison to the number of retorts so few as is the case with stoking machinery. Therefore not only is the inclined system the cheapest, but also the safest and most reliable.

With regard to the remarks made by Mr. Lewis at the meeting of the Midland Association, as to my statement of comparisons not going far enough, I must differ from him in that respect, as I think that any figures required, not only as regards labour, but also as regards the yield of gas and the capital expenditure required for the two kinds of settings, and for the two sizes of retort-house for the same, can be calculated from the table. With regard to the coke fuel, it is, in the case of the Hasse-Didier generators, 14 per cent. by weight of the coal carbonized, and with the generators for the inclined settings 12 per cent. The quantity of coal carbonized with the machine stoking in 24 hours—0·74 ton—can always be considered a fair amount for the size of retort, and compares very favourably with the amount generally charged in English gas-works—as, for instance, at the East Greenwich works, where (according to the figures given by Mr. Tysoe in a recent number of the "Journal") the quantity charged is 0·65 ton in 24 hours.

All the five different systems are worked under precisely the same conditions as to coals, heats, and make of gas per ton, &c.; and in my opinion, it is much more reliable to calculate the cost per ton of coal carbonized or per 1000 cubic feet of gas produced, and not per 1000 cubic feet sold, the percentage of which on the gas produced may be a varying quantity, according to local circumstances—such as leakage, used on works, &c., &c.

E. Drory.

Berlin, March 13, 1902.

New Comparisons in Favour of Coal Gas.

Sir,—In an article published in your issue of the 11th inst., Mr T. E. Pye has made reference to an article written by me, and published by several of the technical journals, entitled "The Healthiness of Gas Lighting." I am quite in accord with the views so clearly expressed by Mr. Pye. It is, however, only right to point out that a single sentence culled out of an article does not convey the essence of the subject dealt with. It is hardly fair to the subject that a single sentence alone should be criticized.

Unfortunately, the very title of the article referred to acted as a red rag to a bull upon electrical experts, although I endeavoured to make it clear that I was not depreciating electric lighting. There cannot be any gainsaying that sulphur is used as a disinfectant; although for such purposes the quantity has to be large. One point I wished to make clear was that the infinitesimal quantity of sulphur present (of course, as sulphurous acid) in the atmosphere, was not injurious to health, but possibly otherwise. It is all very well to claim that any alleviating or remedial effects derived from a visit to a gas-works, or, as roughly suggested, by "tunnel air," are due to the "carbolic acid" and to the "tarry vapours." This is difficult to determine. The vapours from carbolic acid and cresoline referred to are, in my judgment, totally different from the conditions obtained at gas-works.

My article, as a whole, was intended to convey that gas lighting was not detrimental to health, but rather to the contrary; the reason being (as corroborated by Mr. Pye) that ventilation was ensured. The

heated air ascending carried with it disease germs through the ventilators, when provided; and the gas-flame sterilized any disease germs present in the air.

Mr. Pye points out the enormous purifying power a gas-flame exerts in a crowded hall, especially with reference to disease germs. He continues his article by making comparisons between gas and electric lighting; but my argument confined itself to illustrating the healthiness of gas lighting. This subject is one to which you have many times called attention in your columns, and is becoming better understood.

Huddersfield, March 14, 1902. EDWARD A. HARMAN.

Electric Furnaces and Carbide of Calcium.

SIR,—In the article on "Electric Furnaces Present and Future" which appears in this week's "JOURNAL," dealing with Mr. Bertram Blount's paper on "Electric Furnaces" read on the 4th inst. at the Owens College, Manchester, before the local section of the Institution of Electrical Engineers, you quote Mr. Blount's views as to the application of the electric furnace to the production of carbide of calcium, in which he refers to a decision recently given in the Law Courts by Mr. Justice Buckley. Possibly many will agree with me that, as Mr. Blount was one of the expert witnesses retained by the defendants—the United Alkali Company, Limited—it would have been better had he, under the circumstances, refrained from giving his views on the patent question in a paper on a purely scientific subject.

I was very courteously invited by the Hon. Secretary, on behalf of the Institution Committee, to attend the meeting in Manchester; and he sent me an advance copy of Mr. Blount's paper. I informed him that I felt compelled to decline the invitation, as there were so many points on which I totally differed from Mr. Blount; and pending my Company's appeal against Mr. Justice Buckley's decision, I preferred not to raise controversy on matters affecting the patent situation.

Apart from patents, I may be permitted to say that, though there may be some independent writers on acetylene and carbide who give credit to Moissan for showing the world how to industrially prepare calcium carbide in the electric furnace, those who are acquainted with the facts in this country, on the Continent, and in the United States—and they are many—give the entire credit to Willson. In saying this, there is no desire on my part to appear to detract from the value of M. Moissan's wonderful research work with the electric furnace, which must always command the highest admiration.

F. G. WORTH, Managing Director,
Acetylene Illuminating Company, Limited.

3, *Victoria Street, S.W., March* 13, 1902.

Local Exhibitions and Interviewing.

SIR,—In looking through your issue of Feb. 18, I have just come across a short paragraph under the above heading.

I do not know that I altogether agree with the writer's views on the subject of exhibitions, because I think he missed the point that a good many people go to gas exhibitions not alone to see the stoves which are being advertised, but with the idea of picking up some wrinkles in cooking. Of course, I do not recommend a continued series of exhibitions, but a good exhibition now and again.

It has also over and over again come to my notice that people who have attended gas exhibitions, and have really grasped the teachings of the lecturer as to the proper method of using the stove, have proved to be far and away the most satisfactory customers afterwards. The unsatisfactory people are those who get a stove in, but do not know how to use it, and then blame the stove for the failure which comes about through their own ignorance.

Unquestionably, however, the best method of getting new consumers is house-to-house canvassing, the result of which, if the work is properly done, is simply astonishing.

This district contains about 9000 inhabitants; and whereas we had on Dec. 31, 1899, 109 cookers on hire, at the end of the following year, 1900, we had 243, and at the end of 1901, 481.

Outside our own efforts, we owe this result mainly to the good work of the Richmond Gas Stove and Meter Company, Limited, and in a lesser degree to that of the Cannon Iron Foundries, Limited.

For canvassing purposes, I believe a lady canvasser more successful than men—at least that is my experience.

Glastonbury, March 11, 1902. JOHN BISHOP.

Reductions in Price.—At the recent meeting of the Ackworth, Featherstone, Purston, and Sharlston Gas Company, it was stated that, as from April 1 next, the price of gas will be reduced from 4s. 3d. to 4s. per 1000 cubic feet. On the 31st inst., the price of gas at Windsor will be reduced 2d. per 1000 cubic feet.

Gas v. Electricity at Wrexham.—Notwithstanding the competition of the electric light in the borough, the consumption of gas in Wrexham still continues to increase. It was stated in the report submitted at last week's meeting of the Gas Company that the amount of gas sold last year was 6 per cent. more than in 1900. In addition to this growth in the consumption, the unaccounted-for gas has been reduced from 11 per cent. in 1899 to 5 per cent. last year.

Extensions at Dorking.—The Dorking Gas Company resolved, at their meeting last week, to raise further capital, for the purpose of erecting larger purifying plant and an additional gasholder, at an estimated cost of £10,000. This is the second portion of the scheme for raising the producing power of the Company's works to 500,000 cubic feet a day; the present maximum delivery being 250,000 feet, with a storage capacity of only 100,000 feet.

Canterbury Gas and Water Supply.—The past year has been a good one for the Canterbury Gas and Water Company. During the twelve months, the sale of gas has increased by rather more than 4 per cent.; and the question of extending and improving the carbonizing plant is now receiving attention—the Manager (Mr. H. C. Page) being engaged in preparing plans for this purpose. As regards the water-works, the number of consumers steadily increases; and it has been deemed desirable to sink another well and bore-hole.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

BUSINESS sharpened up wonderfully in the Committee rooms during last week. More Committees sat, and more Bills were sent to their final stages in the first House, or had their brief life effectually ended. Gas and Water Bills were prominent in the lists, and so were gas and water men in the rooms and lobbies. After a long and fairly stiff fight, the Commercial Gas Bill was withdrawn from the judgment of Mr. Wason's Committee by an agreement with the London County Council, which agreement robbed the promoters of part of the advantages they sought by the measure. The South Metropolitan Gas Bill got into full swing; and earlier in the week the opposition of the Reading Corporation to the Gas Company's Bill was cleared away. Following the South Metropolitan Bill will come the measure promoted by the West Ham Gas Company. The features of the latter are similar to those of the Commercial Bill; so that the Committee will have no difficulty in grasping the intentions of the promoters. Several Water Bills have been passed forward; but not that of the Devonport Water Company, whose property is to be handed over to the Corporation. The water scheme of the Wolverhampton Corporation has been subjected to a fierce onslaught; but what the outcome will be cannot be stated at the time of going to press. In the case of Gas Bills, applications for new capital have so far been cut down, compulsorily or by arrangement, with a very free hand; and in Water Bills, there has been a noticeable liberality shown to petitioners where compensation water is concerned. After the work in progress is over, the outlook is dull. Of the Gas and Water Bills disposed of in Committee up to the present, there is, we think, only one which is likely to be challenged in the second House, and that is the Broadstairs Gas Bill.

Commercial Gas Bill.

Of the Gas Bills which have been promoted this session, the second in order in point of interest is that of the Commercial Gas Company, which was before Mr. Eugene Wason's Committee from Wednesday to about noon on Friday. It would have ranked first, had not the South Metropolitan Gas Bill appeared on the parliamentary stage with its original proposals, the boldness of which have fixed upon the measure the eyes of the Metropolitan gas world—and others. The Commercial Bill was drawn upon the lines of the precedents created by the recent legislation of the South Metropolitan Company. This calls to memory the fact that it is not so very long since that the late Chairman of the Commercial undertaking (Mr. J. Blackett Gill) told the shareholders that the Company would not enter the portals of Parliament until they were compelled. But Mr. Gill has since passed away, a new Chairman (Mr. W. G. Bradshaw) has taken his place, and Mr. Livesey has joined the Board. The late Chairman was ever an admirer of Mr. Livesey's policy; but he was not so fervid over it that he desired to submit the Company to Parliament before occasion required. Mr. Bradshaw and Mr. H. E. Jones, the Company's Engineer, were rather more enthusiastic; and they were with Mr. Livesey in seeing that in the long run more was to be gained than lost by bringing themselves as early as possible, and to such an extent as their circumstances would permit, into line with the recommendations of Sir James Rankin's Committee, and remodelling their affairs upon the most approved pattern. The Bill contained several proposals; but omitting from notice here those which are purely administrative, and have no particular outside interest, they may be classified under five heads: Conversion of capital, the lowering of the illuminating power, the reduction of the standard price, the prescription of the burner for gas testing, and power to raise additional capital. At the present time, the Company have £550,000 of 10 per cent. capital stock; £280,000 (including £28,125 unissued) of 7 per cent. capital stock; and £300,000 (including £46,713 unissued) of 4½ per cent. debenture stock. The Bill provides for the conversion of the 10 per cent. capital to £1,375,000 of 4 per cent. stock; the 7 per cent. capital (with that unissued) to £560,000; and the 4½ per cent. debenture stock (with that unissued) to £449,999 10s. of 3 per cent. stock—the first two classes of stock being subject to increases and reductions of dividend under the sliding-scale. As to the lowering of the illuminating power, the promoters asked authority to bring it down, in the first instance, from 16 to 15 candles, and ultimately to 14 candles; and concurrently with such reduction to lower the standard price from 3s. 9d. for 16-candle gas to 3s. 5d. for the 15-candle gas, and to 3s. 4d. for the 14-candle gas—increases or decreases of 1d. in the price of gas above or below the standard figures reducing or raising the dividend, in any half year by 1s. 4d. on the 4 per cent. stock and 1s. 8d. on the 3½ per cent. stock. Regarding the testing of the gas—and this has been a sore point with the London County Council—clause 13 provided that the burner to be employed for testing should be Sugg's London argand, and in making the tests that it should be so used that the gas should be burnt at such a rate as would give a light equal to 16 candles, and, when the illuminating power is 14 candles, that the burner should be used with the chimney prescribed by the Gas Referees for 14-candle gas. Provision is made for supplying to, and fixing free, for consumers, as in the South Metropolitan case, burners suitable for the 14-candle gas, on making the change to the lower quality. The further capital asked for was £375,000 of 4 per cent. stock and one-third borrowing powers—together £500,000.

The Case for the Company.

The proceedings on the Bill were almost lifeless; there being only one opponent—the London County Council; and they were there in the exercise of their liberty to oppose everybody and everything as occasion presents. They had not been asked by the Local Authorities more immediately concerned to represent them, nor had those Local Authorities taken any steps to be directly represented. The case for the Bill was stated by Mr. Balfour Browne; and the witnesses were Mr. Bradshaw, Mr. Jones, Mr. Livesey, Sir Frederick Bramwell, and Mr. W. H. Y. Webber. This was Mr. Bradshaw's first appearance for his Company in Parliament since his accession to the chairmanship; and a splendid witness he really made—frank and clear in both his

evidence and cross-examination. It was altogether unnecessary to make much point of the conversion of the capital, seeing the number of precedents for the proposal, and that there was no opposition to the change An explanation for the enlightenment of the Committee therefore sufficed. But it was needful to prove that it would be unfair to impose on the Company the recommendation of Sir James Rankin's Committee, that the standard price of the Metropolitan Companies should be brought down to 3s. 3d. for a 16-candle supply. The environment of the Company is altogether different from that of the two other larger concerns. For the future, they can only look for an endogenous growth. The district is bounded on all sides by other Companies or the river; and the area is completely built upon. The Company have also other drawbacks. The scope for showing greater frugality in working is contracted. The works are cramped, and surrounded by property; and they are not well placed for the economical delivery of material. In addition to this, compared with other London districts, the population is a poor one; and, in the disposal of coke, the Company have to meet with the active competition of the Gaslight and Coke Company, who have a manufacturing station in their neighbour's area. But while the Company's witnesses presented all these things to the Committee, they made little boast of the fact that, in spite of so many hindering influences, they had trodden close on the heels of the South Metropolitan Company in their liberal treatment of the consumers. The reduction of the quality of the gas was not opposed; but the clause describing the burner to be used for testing was vigorously assailed. The promoters, however, held to their point throughout the evidence, that it was simply a question of right that 14-candle gas should be tested in the manner already explained. As to the additional capital, they calculated that it would only suffice for about five years, and that it would be required for raising their works to a more economical level and for meeting the large requirement of the district for fittings on the prepayment system.

The Opposition. In the opinion of the London County Council, there were three objectionable points in the Bill. These were the standard prices, the proposal as to the testing of the gas, and the amount of the additional capital. Immense emphasis was laid on the fact that the Company's proprietors before the report of Sir James Rankin's Committee received, as they were legally entitled to receive, allotments of stock at par, and that, the poverty of the district notwithstanding, the Company had for a number of years been able to pay ½ per cent. more dividend than the South Metropolitan Company. Besides this, the present charge for gas is 2s. 8d.; while the Company confessed that the shareholders would get an equivalent to their existing dividend, under their proposed standard, when the charge was 2s. 9d. These, the opponents thought, were sufficient reasons for not giving the Company a higher standard than in the case of the South Metropolitan Company, and as recommended by the Powers of Charge Committee; and their idea of what was fair was a standard of 3s. 3d. for 16-candle gas, 3s. 2d. for 15 candles, and 3s. 1d. for 14 candles. On this question, Mr. H. E. Haward was the witness for the County Council, and he also dealt with the question of the additional capital, determining to his own satisfaction, from the experience of the past five years, what would be the requirements of the Company in the next five. The evidence of Professors Clowes and Lewes, on the opposition side, in respect of the method proposed for testing the gas, brought out a singular point, upon which the promoters had no opportunity for calling rebutting scientific testimony. It was this, that, on the line of testing proposed by the Bill, 14-candle gas would give a return of 15 candles, and 13 candle gas one of 14 candles. The objection was not raised to the similar clause in the South Metropolitan Bill of 1900 either by the London County Council or the Gas Referees; and if there is truth in their suggestion, then it is not a very creditable performance on their part that they allowed the clause to then pass without protest. The plea of "inadvertence" by the County Council officials is rather funny. Both Professor Clowes and Professor Lewes considered that the prescription of the method of testing should be left to the Gas Referees.

The Result. While Mr. Haward, who was the last witness for the opposition, was giving his evidence, the promoters had been consulting the tables which had been put in relating to the standard price. At the conclusion of the evidence, Mr. Balfour Browne made the admission that he thought the Company were asking for too high a standard by a penny; and he offered to come down to 3s. 4d. for the 15-candle gas, and to 3s. 3d. for the 14-candle supply. A conference on the point found the representatives of the London County Council contented with this concession. But the Company went much further. They also consented to a reduction of the additional capital by £100,000; making it £400,000, which represented a splitting of the difference between the parties. But the Company also abandoned the testing clause. By several in the room, this was considered a matter for keen regret, in view of the fact that the South Metropolitan Bill (which was coming before the Committee next) contained clauses of even a more drastic character regarding the testing of gas. Mr. Balfour Browne, however, in making the announcement, said it was understood that the abandoning of the clause was not to prejudice him in the South Metropolitan Bill. It is a pity this Bill did not take precedence on the list, and have its innings before the Commercial Bill.

The Gas Referees. The peculiar creation of years ago—the Metropolitan Gas Referees—were fully represented during part of the proceedings on the Commercial Bill by Professors Vernon Harcourt and C. V. Boys and Dr. Haldane. Three times in the course of the hearing Counsel for the Board of Trade (Mr. Du Cane) tried to intrude them, or one of them, upon the Committee, though he mildly described it as "offering assistance." There is no precedent for the course proposed by the Board of Trade. The Committee were sufficiently wide-awake to see that the only position the Referees could assume would be one of active hostility to the testing clause; and they were not inclined to accept the proffered aid—at all events, until they had conferred with the Speaker's Counsel and the Official Referee. The view of these high officials was that, as there was no petition against the Bill either from the Board of Trade or the Referees, and no instruction from the House to the Chairman of the Committee to call the Referees, the Committee must decline to hear them. The same ruling applied to the South Metropolitan Bill, in which the Gas Referees have a greater personal interest even than they had in the Commercial measure. The Board of Trade and the Referees now know something of which they were evidently not previously aware.

South Metropolitan Gas Bill. One is getting accustomed to seeing the South Metropolitan Company in the Committee rooms; and when they are there, the proceedings are anything but featureless. The hearing of the case for the present session's Bill commenced immediately after the disposal of the Commercial measure; and it was at once apparent that it possessed, for a large number of private persons and public bodies, a greater interest than its predecessor. Several Counsel put in an appearance on the opposition side; and experts and officials of the parties were plentiful. The engineers who were engaged on the Commercial Bill were again acting for the South Metropolitan Company; and their number was reinforced by the addition of the Company's Chief Engineer (Mr. Charles Carpenter) and Mr. Charles Hunt. In connection with the testing clauses, several experts have been retained, but whether they will all be required is another matter. There were present in the throng at the back of Counsel, Professor Dewar, Dr. Samuel Rideal, Mr. Sugg, Mr. Dibdin, and Mr. Otto Hehner. At the backs of the opponents were noticed Mr. E. H. Stevenson, Mr. W. A. M'Intosh Valon, Mr. W. R. Herring, Mr. Isaac Carr, Professor Lewes, Dr. Percy Frankland, Professor Clowes, and Mr. C. R. Bellamy. Foremost among the petitioners were the London County Council, Messrs. Redpath, Brown, and Co., Limited (who are interested in the land proposed to be acquired at East Greenwich), the Conservators of the River Thames, and Messrs. G. & A. Harris, large owners of property adjoining the East Greenwich site. Counsel were reserved for several of the other petitioners.

The Company's Requirements. Ignoring the minor points of the Bill, the provisions have three main objects: The acquisition of land at East Greenwich and a small portion of property at Vauxhall and Bankside; the testing of gas, and the dismissal (with compensation) of the Gas Referees so far as the Company are concerned; and the increased remuneration of the Directors, upon which there is no opposition, and the proprietors are agreed. The first two are large proposals, and will claim from the Committee considerable attention; but, for the purposes of this bird's-eye view of the proceedings, they can be brought into very narrow compass. The additional land which it is proposed to acquire at East Greenwich will, if the power to purchase is obtained, add something like 160 acres to that already in possession of the Company there. Over such an extensive area, it will be necessary to make certain small road diversions. As to the testing of the gas, the Company ask to be placed under the provisions of the Gas-Works Clauses Act of 1871, using the burner prescribed by their own Act of 1900. Following this, they have inserted various provisions dealing with the quantity of sulphur and ammonia which may be permitted—viz., 22 grains of sulphur (other than sulphuretted hydrogen) in 100 cubic feet of gas, on an average of six days at any testing-station; and of ammonia 4 grains in 100 cubic feet. The effect of these provisions, if passed, will be to abolish the Gas Referees so far as the South Metropolitan Company are concerned—one of the grounds for this drastic movement being that the Board of Trade have not complied with the requirements of the Act under which the Referees have their being, by appointing one with practical knowledge and experience of the manufacture of gas. Then, showing that they bear no malice towards those whose laws and regulations have so tightly fettered them in the past, the Company propose to compensate the Referees and the Chief Gas Examiner for the loss of their emoluments on the basis of a seven years' purchase of the sum paid by the Company towards their fees during the year ending June 30. At the time the Committee rose on Friday, Mr. Livesey was the only witness who had been examined. He showed the Committee that the land provision for the future was a necessity to-day, if the Company were not to be driven further afield than at present for works accommodation. Leading up to the provisions regarding the testing of gas, he gave the Committee an abundance of information on the advantage to the consumers of a cheap supply. The finicking requirements of the Referees as to purity were severely condemned by him; and he explained how the conditions of the gas supply of to-day were altogether different from those which existed at the time the first Referees entered office. The whole of the sitting yesterday morning was occupied by the further examination of Mr. Livesey and part of the afternoon in cross-examination. His evidence was largely directed to the testing clauses; and he did not spare the prescriptions of the Gas Referees. Throughout it all, Professor Harcourt sat patiently and listened to the severe denunciation. The question of the East Greenwich site was the only other matter that claimed attention; and, during the afternoon, it was understood that certain of the objectors on minor points were in a fair way of being satisfied. But Messrs. Redpath, Brown, and Co., and Messrs. Harris have, we believed, decided to stick to their guns. Mr. Charles Carpenter occupied the witness chair the latter part of the afternoon, and he was examined on engineering matters. The opponents appear to think that the Company are looking a great deal too far ahead in regard to the East Greenwich site, and they seem to be particularly anxious to know how the Company intend dealing with it. But it is a bit too early to talk about this yet. At the close of the sitting, it looked as though at least a couple more days would be needed for the disposal of the Bill.

From Birmingham to London. Mr. Charles Hunt was in the Committee Rooms at the end of last week, having been retained (as previously mentioned) in connection with the South Metropolitan Gas Bill. It is current that we shall be seeing more of Mr. Hunt in and about Westminster after next October; he having, it is understood, definitely decided, at the end of his engagement with the Birmingham Corporation, to come to London.

Reasonable Reading. Notwithstanding the fact that the Reading Gas Company have been working under certain onerous conditions imposed by old Acts (as will be found set forth in the report elsewhere of proceedings before Sir Savile Crossley's Committee), they have been prosperous, and their capital regarded from

the usual standpoint is below the average of companies similarly circumstanced. This attests an efficient and enlightened management in the past, and it stood the Company in good stead on asking Parliament this session to entrust them with enlarged powers. The main feature of the Bill was the consolidation of the capital on a 5 per cent. basis, with the addition of £180,000, and one-third loan upon the total amount of the additional and converted capital. The effect of this last-named proposal would have been to raise the amount to be borrowed on the converted capital by £29,958; and this with the £180,000, and the one-third borrowing power, would have given the Company the round figure of £270,000. This would have been sufficient to keep them from coming to Parliament for some twelve or fourteen years; and this long exemption from scrutiny the Corporation apparently resented, although there was no complaint against the past administration of the Company's affairs. There is really little to be said about the Bill, as, under the circumstances, there were no enlivening features about the opposition case. The expert evidence for the Bill was laid before the Committee by Mr. Corbet Woodall; while Mr. W. A. M'Intosh Valon presented the arguments for a reduction of the proposed new capital. After the hearing had reached this point, there was a little consultation from which issued an agreement that showed a fair moderation on the part of the Corporation and a reasonable desire to meet their wishes on the part of the Company. It was agreed that the additional capital should be lowered to £150,000 (a concession of £30,000), with one-third borrowing powers; but on the converted capital the borrowing powers are to be limited to one-fourth, less £32,500 already raised. The effect on the total capital was to reduce it by £55,615. The contingency fund is repealed, and the reserve fund is restricted to £27,000. The notice by the Corporation to the Company of the time and place of gas testing is to be repealed. The maximum price is to be 3s. 9d. within the borough (a reduction of 6d.); but there is to be no change in the outside districts. Any discounts or rebates allowed by the Company are to be of equal amount, under like circumstances, to all consumers; but the provisions of the section will not apply to the gas supplied to the public lamps. A new clause is inserted, providing that, when the 5 per cent. stock to which the 7 per cent. shares have been converted is offered for sale by auction or tender, the Company shall have power to fix the reserve price below par. Experience elsewhere has proved that the par reserve price is sometimes a bit inconvenient.

Wolverhampton Water Bill. One of the severest fights which we are likely to witness over a Gas or Water Bill this session was being waged the whole of last week around the Water Bill of the Wolverhampton Corporation; and just before the Committee rose on Friday, the Corporation case was only completed with the evidence of Mr. H. Ashton Hill, one of the Engineers called to support the proposals of the Bill. The promoters' own Engineer (Mr. E. A. B. Woodward) was in the chair all one day, and was subjected to a sharp fire from the representatives of the host of opponents. His proposals were endorsed by Mr. G. H. Hill, Professor Lapworth, and Mr. William Whitaker; and, if the Bill goes through, it will certainly be a feather in the cap of Mr. Woodward. This is the second session the Bill has been introduced; last session it had the misfortune to be thrown out on second reading. Altogether a few thousands have been spent on the scheme in parliamentary proceedings alone. Proof of the insufficiency of the present supply was laid before the Committee, which, by the way, is Sir Savile Crossley's. By the Bill, it is proposed to bring the supply of water up to 6 million gallons a day; and the estimated cost of the necessary works is about £250,000. Wells and works at Hilton will involve roughly £79,000; similar works at Stableford, £35,000; a reservoir at Tettenhall (of a capacity of 6 million gallons), £15,000; and a service reservoir at Goldthorn Hall, £14,224. A tramway near the existing Cosford works is calculated to cost £5559; and the general improvement of the water-works and other additions is estimated to cost £101,000. From this brief sketch, it will be seen that the scheme is an ambitious, but, in the view of the eminent authorities named, an absolutely essential one. The petitioners against the Bill urge that the promoters can supply their needs without sinking wells; and, as an alternative, they should take their water supply from Birmingham. The answer of the experts for the Bill to the first contention is that, in their opinion, the proposed pumping-stations would have no injurious effect on the other wells in the locality, and, to the latter (Wolverhampton, like many other authorities, having a right to purchase from the abundance of Birmingham's new supply, if there is a surplus), that the cost of obtaining a supply from Birmingham would mean £33,000 a year, as against £18,000 a year under the present scheme—the expectation being that, from the new works water will be obtained at 3½d. per 1000 gallons, as against 6d. from Birmingham. In addition to this, Mr. Woodward reckons that, even if water was obtained from Birmingham, works would have to be constructed at a cost of about £160,000. How long the opponents' case will last, no one at the end of the week was able to forecast.

The Strained Relations at Devonport. There is no such effectual place as Westminster for smoothing out troubles, whether or not in the process an injustice is done to one or other of the parties. When once the noble members of the Upper House or the honourable members of the Lower Chamber have decided that this or that shall be, the defeated party may grope about in some cases for ever, and never find an opening for appeal, and in other cases for a year, and perhaps for a number of years, before he or they can find another opportunity for trying to get redress for a grievance, supposed or real. As readers are aware, there has for some time been a division between the Devonport Water Company and the Corporation; and while they remained at home, there was not the slightest prospect of their being brought to a state of perfect peace. They both came to Westminster completely equipped for war; and they entertained the Earl of Dartrey and a few of his noble colleagues in one of the Committee rooms during the past week. In the result the Lords awarded the laurel wreath to the Corporation—not because they succeeded in vanquishing the Company, but because, in the exercise of the wisdom with which they are endowed, their Lordships considered that that phantom of the Committee Rooms, "Public Policy," demanded the transference of the property of the Company (who have been in existence since the year 1793) to the Local Authority. There are a few curious points about these Devonport Bills, which may be briefly alluded to. In the first place, it should be explained that both parties had Bills before the Committee. The Corporation, in their measure, ask for power to purchase the undertaking of the Company, on notice to be given within six months after the passing of the Act. Provision is thoughtfully made for the compensation of the Manager for any direct pecuniary loss he may sustain by the transfer. The Company, on the other hand, sought, *inter alia*, for power to construct additional works, and consequently for extra capital; but to their Bill little attention need be given as the proposals have sunk under the decision of the Committee. The Corporation had no complaint to make regarding the purity of the Company's supply; but there has been confessedly a shortness at times in dry weather. Herein it is that the Company have failed in not coming to Parliament earlier for powers to construct additional works. But, on the other hand, their enterprise has not been a particular financial success; the utmost dividend they have ever paid having been 5 per cent. Any extension of works would have added to their present burden, and would in all probability have jeopardized for a time a part of their dividend. But it was a difficulty that would have had to be faced by them sooner or later; and from our point of view, the sooner the better for the consumers and ultimately for the shareholders. But now here is one of the strange things about these two Bills. The Company came to Parliament to rectify the deficiency of the past by obtaining new powers; but the Corporation with all their upbraiding of the Company on account of the deficiency of the past, did not include in their own Bill anything in the nature of provision to remedy the shortness of the supply in the dry season, nor were money powers sought. Underlying their evidence, however, was a hope that Plymouth might be induced to amalgamate with Devonport for water-supply purposes; but all that can be expected of Plymouth is, so far as can be seen, that they will do for the Corporation what they were prepared to do, and have been doing, for the Company—that is, give them a supply so long as they themselves have a surplus. It is unnecessary to go into the case presented on behalf of the Company's Bill; it being sufficient to say that there was ample evidence produced, both local and expert, to show that the Company's conduct in the management of their business is far from being as bad as the Corporation witnesses painted it during the hearing of the case for the Purchase Bill. Although the Committee have pronounced in favour of transfer, as things stand at present, it is difficult to see where or how the people of Devonport are to be benefited.

Wrexham Water. Before the House of Lords Committee presided over by that experienced Select Committee Chairman, the Earl of Camperdown, the Wrexham Water Company last Wednesday introduced their Bill. The main proposals of the measure number half-a-dozen—the construction of a storage reservoir, the acquisition of a small mill, the purchase of ¾ acre of land, conversion of capital, the authorization of additional capital, and the change of the Company's title. The last three points were uncontested; but there was opposition on the three first-named objects—the petitioners alleging interference with their rights, and asking for compensation. Consequent on the great increase in population, the Company's business has enormously developed; and the Engineer of the Company (Mr. Frederick Storr) made it clear that the contemplated works are absolutely necessary. The projected reservoir is to be of considerable magnitude; the time which will be required for its construction being computed at five or six years. The ground on which the reservoir is to be built is situated in parishes with names unfitted to the English tongue—Esclusham and Rhosllanerchrugog; but the Company have succeeded in purchasing the site by private treaty. Not only this, but they have effected arrangements with the property owners through which the pipe-line will run. Under such favourable circumstances, the course of the Bill looked easy; and it proved to be so. On the second day, Mr. Storr's examination showed the Company to be in a most tractable frame of mind; and, although they had suggested to the petitioners a compensation of 25,000 gallons per day, they gave another 15,000 gallons to save further trouble. On one or two smaller points concessions were made; and now the Bill will proceed.

Another Welsh Water Bill. As in the preceding Welsh Water Bill, the most important part of the opposition to the Ystradfellte Water Bill had reference to compensation; and, again as in the case of the Wrexham measure, the Bill passed the Upper House Committee after provision was made for extra compensation. The Bill is promoted by the Neath Rural District Council; and, mentioning this, reminds us that the promoters were informed by Mr. Wedderburn, K.C., the Counsel for one of the petitioning firms, that a Rural Council have no power to use their funds for the promotion of a Water Bill in Parliament. However that may be, the Neath Council are apparently going to get theirs home. It is the great development of the coal-fields which has produced a rapid growth of the district, and made imperative the introduction of a new scheme of water supply. The main feature of the projected works is the construction of a gigantic reservoir—600 million gallons in capacity—on the Tringarth tributary of the River Neath; and the area it is proposed to benefit is the large rural district of Neath and Aberavon. The reservoir is intended to catch the flood waters during winter, and to use them in the summer to increase the flow of the stream and for compensation purposes. The cost of the undertaking, including that of conveying the water to various centres of population within the area, will, according to the estimates, be £162,000. The evidence was contradictory as to the wants of the population; but there was a decided preponderance of local testimony in favour of the Bill. The sharpest opposition was offered by Messrs. Curtis and Harvey, who are the owners of extensive mills, and require a considerable amount of water power. Their Lordships allowed the Bill to proceed, on condition that a clause was inserted providing that the promoters shall discharge into the river compensation water sufficient to raise the flow to the firm's mills to 720,000 gallons per hour—the amount of the extra compensation water and the number of days on which it is required to secure the working of the mills as at present to be settled by agreement, or, failing agreement, by arbitration. The Council were also prohibited from constructing any part of their conduit in the urban district of Margam.

HOUSE OF LORDS.

Monday, March 10.

LONDON WATER BILL.

Lord JAMES OF HEREFORD presented a Bill "for establishing a Water Board to manage the supply of water within London and certain adjoining districts, for transferring to the Water Board the undertakings of the Metropolitan Water Companies, and for other purposes connected therewith," and it was read the first time.

Thursday, March 13.

LONDON WATER BILL.

Lord JAMES OF HEREFORD, in moving the second reading of this Bill, explained that those who were the guardians of the procedure of their Lordships' House felt that, in order to give effect to the resolution of the House of Commons that the Bill should be referred to a Joint Committee of both Houses, it was necessary to introduce a measure identical with that which had been read a second time in another place. It was felt that, in the circumstances of the case, one inquiry was better than two. The inquiry must be one of considerable length, and involve very great expense; and, as some of the parties interested in the matter would, in the conduct of their case before the Committee, be spending the money of the ratepayers, it was felt that such expenditure should not be repeated by the holding of a second identical inquiry. The procedure by Joint Committee seemed to be not only advisable but necessary. This being so, it was held that, in order to give that House, as it were, the right position in the Committee, a Bill should be introduced into their Lordships' House. It was, however, not intended to proceed with it, except so far as the purpose of its going before the Committee necessitated this being done. The Bill of the House of Commons, after the inquiry of the Committee, would be returned to that House, and, having been considered, would be sent to their Lordships' House to be proceeded with as though the Bill he now asked them to read a second time had never been introduced.

Lord TWEEDMOUTH said the procedure was undoubtedly somewhat unusual, and it seemed to him to be unnecessary. He believed the House had power at any time to join a Committee of the other House for any purpose whatever, without the preliminary introduction of a Bill as in the present case.

The EARL of MORLEY explained the distinction between Private and Public Bills which made the suggested procedure necessary.

The MARQUIS of SALISBURY commented on some remarks made by Lord Tweedmouth, which he characterized as scarcely just towards the ordinary procedure of the House. He said entire freedom from party bias and from leaning to one interest or another was the universal rule on all Committees, and especially on Private Bill Committees. He hoped that, whatever the issue might be, the inquiry would be carried out in an impartial manner, with the single object of the public interest in view.

After some further discussion on procedure,

Lord JAMES OF HEREFORD, in reply to questions, said the Bill, after passing through the Joint Committee, would go through its various stages in the Commons, whence it would be sent to their Lordships' House and would then take the ordinary course.

The Bill having been read a second time, it was resolved—"That this House do concur in the following resolution communicated by the Commons: 'That it is expedient that the London Water Bill be committed to a Joint Committee of Lords and Commons.'"

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Abercarn Urban District Gas Bill, Wadhurst Gas Bill.

Bills reported, with amendments. Birmingham Corporation Water Bill, Caterham and District Gas Bill, Deal and Walmer Gas Bill, Wrexham Water Bill.

Bills read the third time and passed: Birmingham Corporation Water Bill.

The Select Committee on the Devonport Water Bill reported last Friday that the preamble had not been proved.

HOUSE OF COMMONS.

Thursday, March 13.

WELSBACH LITIGATION.

At the afternoon sitting of the House, Mr. Weir put to the Attorney-General the question on the above subject which stood in his name, and the text of which was given in the "JOURNAL" last week. He was informed, in reply, that, as the return required related to private litigation, it was not advisable that it should be granted.

The following further progress has been made with Bills:—

Bill read a second time and committed: Grand Junction Water Bill.

Bills reported, with amendments: Commercial Gas Bill, Finedon Urban District Water Bill, Higham Ferrers and Rushden Water Board Bill, Newport Corporation Bill, Reading Gas Bill, Shepton Mallet Gas Bill.

Bills read the third time and passed. Abercarn Urban District Gas Bill, Broadstairs Gas Bill, Bromley Gas Bill, Limpsfield and Oxted Water Bill, Wadhurst Gas Bill.

The Windsor Royal Gas Company have just placed with Messrs. R. & G. Hislop, of Paisley, an order for a bench of eight ovens of eight retorts on the firm's shallow plan, and the Cirencester Gas Company for two ovens of seven retorts on the stage-floor system.

HOUSE OF COMMONS COMMITTEE.

Wednesday, March 12.

(*Before Mr.* EUGENE WASON, *Chairman, Lord* BALCARRES, *Mr.* C. P. TREVELYAN, *and Major* KENNETH BALFOUR.)

COMMERCIAL GAS BILL.

Mr. BALFOUR BROWNE, K.C., Mr. BAGGALLAY, K.C., Mr. MOON, and Mr. SNAGGE appeared for the promoters. The only opponents were the London County Council, who were represented by Mr. FREEMAN, K.C., Mr. TALBOT, and Mr. BERNARD WILKINSON.

Mr. BALFOUR BROWNE, in opening for the Bill, said the object of the measure was to authorize the conversion of the capital stock and debenture stock of the Company into stocks of other nominal amounts, but yielding equivalent dividends and interest; to empower the Company to raise additional capital; and to amend their Acts of Parliament. The district of the Company was, he explained, almost entirely devoid of high-class or wealthy residences, and therefore the Company were carrying on their business at a manifest disadvantage as compared with the two other Metropolitan Gas Companies. The capital power sought was as to £5co,ooo, which it was estimated would last them not quite five years; that period being in accordance with the recommendation of Sir James Rankin's Committee. In regard to the conversion, he said they had some 10 and some 7 per cent. stock; but it could only be bought to return about 4 per cent. The proposal was to convert the 10 per cent. stock into 4 per cent. stock, the 7 per cent. stock into $3\frac{1}{2}$ per cent. stock, and the debenture stock from $4\frac{1}{2}$ into 3 per cent., at which rate it was believed all future debenture stock of the Company would probably be raised. The conversion of this stock was merely a nominal matter, and it did not mean that the consumers would have to pay any more. Another proposal of the Bill was to alter the illuminating power of the gas and the standard price. What was wanted now-a days was not high illuminating power, but cheap gas. Under their Act of 1875, the illuminating power was fixed at 16 candles, the standard price at 3s. 9d. per 1000 cubic feet. Gas of 16-candle power could not be obtained from ordinary Durham coal. Therefore the gas had to be enriched; and to do this most companies used water gas, which was a dangerous gas not used in this country to nearly so great an extent as in America. This high illuminating power cost money, but was not required by the consumer, because the illuminating power of gas was now very largely a question of the burner used. Thus a Welsbach burner would give to 10-candle power gas an illuminating power of from 50 to 60 candles. Concurrently with the reduction of candle power, it was proposed to reduce the standard price; because, as the Company would be enabled to make gas cheaper, they thought that the consumer ought to have the benefit of the saving. The only way in which the Company would gain was by increasing the sale of gas. The Bill proposed that from 1st of January next the candle power should be reduced from 16 to 15, and the standard price from 3s. 9d. to 3s. 5d.; and that from 1st of January, 1907, the Company should be still further able to reduce the illuminating power to 14 candles, and the standard price to 3s. 4d. The Commercial Company were not in a position to supply gas nearly so cheaply as the South Metropolitan Company. In the report of Sir James Rankin's Committee, there was a recommendation that the standard price should be 3s. 3d. for all the London Companies. In that report, also, a good deal was said about the mismanagement of the Gaslight and Coke Company, but very little about the mismanagement of the Commercial and the South Metropolitan Companies; and the Committee, in making their recommendation, overlooked the fact that there were great distinctions between the three Companies. Some of the Companies were conducted on such an enormous scale that they could manufacture gas more cheaply than others. At present, the Gaslight and Coke Company were actually charging 7d. per 1000 cubic feet more than the South Metropolitan Company were, and 4d. more than the Commercial Company. That might be due to mismanagement, because they had a splendid district.

A MEMBER OF THE COMMITTEE: They have been to Parliament since this report was made.

Mr. BALFOUR BROWNE: They have been thrice, and their Bills have been rejected, because they would not accept the various recommendations in the report. Continuing, Counsel asked the Committee not to enforce the reduction of the standard price to 3s. 3d. in the Commercial Bill because they could not possibly make gas more cheaply. All the promoters asked the Committee to consider were the conditions of the times—which had lately been bad for gas companies—and the condition of the Company. The Company were not in so good a condition as any other London Gas Company. They were a small Company with a poor district, a bad sale of coke, and three separate sets of works. The only petition against the Bill was that of the London County Council—the Local Authority for the purpose of the Gas Act of 1860. None of the other local authorities opposed the measure. The London County Council in their petition referred to the recommendation of Sir J. Rankin's Committee, that the standard price should be reduced, and pointed out that, in consequence of the extensive powers for raising capital conferred on them in 1875, the Company had for a long time escaped from having to submit their affairs to public criticism and review by Parliament. The petitioners also said they were not convinced as to the necessity or expediency of the proposed conversion of capital, particularly so far as it affected the debenture stock of the Company. They submitted that the effect of the conversion would be to cause an addition to the saleable value of the Company's capital, and that, as regarded the capital already issued, while it would be advantageous to the shareholders, it would confer no benefit on the public or the consumers of gas. He confessed that he did not understand this allegation. The change could not do the consumers any harm, as the Company were to pay exactly the same amount in dividends as they paid at present. The petitioners went on to say that the shareholders of the Company had, in the past, and up to a comparatively recent date, derived great pecuniary advantage through the issue to them of

capital at par, and that they had obtained all the advantages of the sliding-scale, in the form of extra dividends in excess of the prescribed rates, without coming under the obligation which was imposed in 1876 on the other two Metropolitan Gas Companies of issuing their capital by auction or public tender. This, however, was a complaint of the action of Parliament. In passing the Company's last Act, Parliament had not in 1875 adopted the auction clauses, and therefore the Company had not come under them. Of course, the Company had distributed their capital, as they were entitled to do, to a large extent among their shareholders. In future, however, every penny of their capital would be raised under the auction clauses. The County Council went on to say: "Your petitioners submit that the proposed reduction of standard price to 3s. 5d. for 15-candle power gas and 3s. 4d. for 14-candle power gas is insufficient, and that, in accordance with the recommendation of the Select Committee of your honourable House before referred to, the Company's standard price should be reduced to 3s. 3d. for gas of 16-candle illuminating power, and that, if the standard illuminating power is allowed to be reduced, the standard price should be 3s. 2d. for 15-candle power and 3s. 1d. for 14-candle power." This he regarded as the real point of the petition. The capital of the Company had, however, been subscribed on the strength of the existing standard price of 3s. 9d. The Company were willing to meet Sir J. Rankin's Committee as far as they could; but they could not afford to put their price down to 3s. 3d. They could not reduce the price to starvation figures.

Mr. *W. G. Bradshaw* (Chairman of the Company), examined by Mr. MOON.

Witness said that the Company's district was circumscribed and very poor. It had no high-class residential population. They supplied one ninth of the population of London with gas, but only one-thirteenth of the total quantity consumed in London. While the population of the district numbered 490,000, the number of consumers was only 24,000, apart from 15,000 coin-meter consumers, who did not use much gas. No expansion of the district was possible. On the south, the district was bounded by the River Thames, on the west, north-west, and north-east by the Gaslight and Coke Company, and on the east by the West Ham Gas Company. The district had been built over for many years. Any increase in the sale of gas came mainly from the introduction of coin meters, and was entirely dependent on the supply of cheap gas. The Company were incorporated in 1847, with a capital of £280,000. Under an Act of 1875, the capital was increased to £1,130,000, which was the present authorized capital. £28,125 of 7 per cent. stock and £28,125 of debenture stock, or £56,250 in all, remained still unissued. The introduction of the sliding-scale in 1875 had resulted in great advantage to the consumers of gas. For every reduction of 1d. in the price of gas, the consumers got £11,070 and the shareholders £2000; so that the arrangement was 5½ to 1 in favour of consumers. Out of every economy of £1 effected, the consumer got 16s. 11d., and the shareholder 3s. 1d. He had prepared a table setting out exactly how much consumers and shareholders had benefited since 1875. It showed that during the twenty-five years the consumers had been given £2,500,000 by the sliding-scale. In the same period, the shareholders had gained £484,000. Incidentally, the table showed the price charged for gas from the year 1876 down to the present time. There was a gradual decrease till the figure of 2s. 6d. was reached. In 1890 and 1891, the price stood at 2s. 4d.; but it had not since been as low as that. The present price was 2s. 8d.; and the authorized statutory dividend on the 10 per cent. stock was 13¾ per cent., and on the 7 per cent. stock 10¼ per cent. The dividends actually being paid were 12 and 9 per cent. respectively; so that there was a saving, practically to the consumers, of 1¾ per cent., or about £10,000 a year, at the present time. The reason why the full dividends were not paid was that the circumstances of the time were abnormal. The price of coal was very high, and the price of coke very low. Of course, it was to the advantage of the Company to sell the gas, and therefore they kept the price down. The same thing had taken place in other years; so that practically over the whole quarter of a century the Company had been ¼ per cent. below their authorized dividend. The sum of £112,000, taken from the reserve fund and undivided profits, had also been devoted to keeping down the price of gas.

Mr. MOON: Speaking generally, the policy of the Directors has been to keep the supply of gas at the lowest possible cost?

Witness: That has been our aim all the way through.

One of the results of that policy is that you are not much troubled with the competition of the electric light?—The Boroughs of Stepney and Poplar have both started electric undertakings; but they have not been successful, except with the public lights, which are absolutely under their control, and with which they can do as they please.

In reply to a question as to whether the Company had had any complaints, witness said they had been wonderfully free from them. The only complaint he could recall was made in 1900, when the price of coal went up, and the Company had to raise the price of gas. A deputation, which included some Members of Parliament, then waited on the Directors; but, after they had heard the Company's explanation, they expressed themselves as perfectly satisfied. The explanation was that the extra cost of gas was far more than the increased price which the Company were charging. The fact that the Company had taken £12,000 from the reserve fund was the best proof of this. In the evidence given before Sir James Rankin's Committee, no complaint was made against the Commercial Company, who were rather held up as a pattern to the other Companies. The capital of the Company had all been economically dealt with. For the year 1900, the capital per million cubic feet of gas sold of the Commercial Company was £425, of the South Metropolitan Company £417, and of the Gaslight and Coke Company £638. The Company had very moderately dealt with the powers that had been conferred upon them, as was shown by the low price charged for gas and the way in which the Company had dealt with their capital and their power to pay dividends; and that was borne out by the fact that before Sir James Rankin's Committee no charge was brought against the Company. The Company had three sets of works, which was a great drawback. One works would be quite sufficient, and much cheaper. The works at Stepney were their original works; but they produced as little gas as possible there, because, being on the Regent's Canal, dues of 2s. a ton had to be paid on coal going to the works. Wapping was the best situated of the works, being on the river side. At Poplar, 44½ per cent. of the gas was made. The latter works were on the River Lea, and the extra cost of barging coal there amounted to 1s. 6d. a ton over the cost at Wapping. One of the bridges over the Lea which had hitherto prevented steamers getting up the river was being altered, and the Company hoped to obtain some specially constructed boats which would pass up and save that 1s. 6d. a ton. The expense of manufacturing gas had increased owing to the conditions under which the Company manufactured. In the sale of residuals, the Commercial Company were at a great disadvantage compared with both the other Companies, because at Bow Common, inside the Commercial Company's district and just outside the Poplar works, were the large works of the Gaslight and Coke Company. The result of this competition was that the Commercial Company's coke sales were much worse than those of other Companies. The conversion of the stock would not impose any charge on the consumer. The advantage of conversion was that there was a better market for stock of a smaller unit—investors preferring as a rule to buy stock at a low rather than a high premium. The further capital sought was to provide for the extension of the business, to equip the works with labour-saving machinery, and to enable the Company to bring their coal more cheaply to Poplar; and also for the provision of more coin-meters, which were a great convenience to the working classes. The cost of providing a meter and fitting up a house was from £4 to £5. There was an amount of capital unissued; but a large overdraft at the bank just about balanced that. The additional capital would be raised—£375,000 as 4 per cent. stock, and £125,000 as 3 per cent. debenture stock. The increased sales of gas for the next five years, if continued at the same rate as for the last five years, would be about 30 per cent. For the last few years, the increase had only been about 23 per cent., but their coin-meter business was being developed rapidly, and therefore he put it at 30 per cent. The reduction in the standard price proposed in the Bill was not a little compliance with the recommendation of Sir James Rankin's Committee, but it was quite clear from the report of the Committee that the Commercial Company were not in their minds in drawing up the report, which dealt almost wholly with the Gaslight and Coke Company.

Mr. MOON: If you cannot manufacture as cheaply as the South Metropolitan Company, would it be fair to put you at the same standard price as that Company.

Witness: Clearly not.

Is it your case that, owing to the circumstances you have indicated to the Committee, you are not in as good a position for the supply of cheap gas as the South Metropolitan Company?—No. There are two principal reasons for that. The first is that the South Metropolitan Company's district is a very fine one from a gas point of view. They have a good suburban district, and their sales go up at an enormous rate. In the second place, they have splendid modern works at East Greenwich on the river, and every facility for getting their coal reasonably and for the cheap production of gas. Then the size of their works also enables them to produce gas much more cheaply. They use labour-saving machinery, which is not so profitable to us in a small works.

So that if it is fair that the South Metropolitan Company should have a standard price of 3s. 3d., it is fair you should have a higher price than 3s. 3d.?—Yes; because it costs us more to manufacture gas.

Continuing, witness said that the amount of gas supplied by the Commercial Company was less per mile than was the case with the other two Companies. In 1900, while the South Metropolitan Company had 215 consumers, and a sale of 11 million cubic feet per mile of main, the Commercial Company had only 132 consumers and 9,247,000 cubic feet per mile. This greatly affected the relative prices at which the two Companies could supply gas. The difference in the cost of manufacture between the two Companies was at least 4d. per 1000 cubic feet. The standard price of the South Metropolitan Company was fixed at 3d. below that of the Commercial Company in 1876, because it was known even then that the former could produce gas more cheaply than the latter. The South Metropolitan Company had reduced their standard by 3d., and the Commercial Company were proposing an exactly similar reduction. With regard to profit-sharing, the proposal of the Bill was simply to enable the profit-sharer to nominate someone to receive his profit; and it enabled the Directors to pay money to the nominee of the person entitled to it.

Mr. MOON: In the future, will the cost of production be higher or lower than in the last few years?

Witness: The fact that the Government have put a tax on exports of coal, and have appointed a Commission to inquire into the coal supply of the future, rather point to the fact that coal will be scarce. If so, the cost will go up and that will increase the cost of gas production.

In any case, is it likely that the cost of gas will come down to a greater extent than your proposal to lower the standard?—No.

Your proposal to reduce the standard price is in connection with the supplementary sliding scale suggested by Sir James Rankin's Committee and modified by Mr. Oldroyd's Committee?—Yes; we follow the precedent of the South Metropolitan Company, word for word.

Continuing, witness said that, under the proposals of the Bill, shareholders would receive less dividend than now, until the price of gas was reduced to 2s. 9d., when they would get exactly the same. When the price was less than 2s. 9d., the shareholders would receive a little more. The Bill thus gave every inducement to the Company to keep the price down. The Bill would not affect future shareholders, but only those who had bought holdings on the faith of a certain standard price—the penalty would fall entirely upon the present shareholders. If the proposal of Sir James Rankin's Committee were adopted, and the standard price were reduced to 3s. 3d., the present shareholders would never see the same dividends as they at present enjoyed, until the price of gas was reduced to 1s. 9d.

Mr. MOON: With reference to the reduction of the illuminating power of the gas from 16 candles, is it your experience that a high illuminating power is now required for the purposes for which gas is sold?

Witness: No; so far from being required, it is really a detriment to the consumer. A much larger proportion of gas is used in the daytime

for gas-engines and cooking; and even the portion which is used for lighting does not require a high illuminating power, because of the Welsbach and other burners, by which one can get a much higher effect from a low candle-power gas. What is wanted is a cheap gas of low illuminating power. Gas of 14-candle power is very common all over the country. The result of reducing the illuminating power by 1 candle would be a saving of 1d. per 1000 cubic feet.

In cross-examination by Mr. BERNARD WILKINSON, witness said the Bill proposed to increase the capital of the Company by £500,000, which it was hoped would last five years. He accepted as approximately right the statement of Counsel that in the last five years the capital expenditure of the Company had been only £200,000, and in the previous five years £64,000. The supply of slot meters locked up a great deal of capital. That supply began in 1893; so that the period referred to would cover the time during which the consumption of gas by slot meters was in vogue. The Company had, however, rather starved the slot-meter business, because they had not had the capital to spend. There was no possibility of the district expanding outwards; but by keeping the price down, they might cause an increase in the demand. The unexhausted capital powers of the Company about covered their overdraft at the bank. The £580,000 capital powers granted under the last Act of the Company, in 1875, lasted 27 years; but there had been a most unexpected stagnation in the trade of the district. With regard to the proposed reduction of standard price, Counsel said he understood the contention of the witness was that the affairs of the Commercial Company were not gone into before Sir James Rankin's Committee, who reported in favour of a reduction of the standard price in the case of the Metropolitan Gas Companies to 3s. 3d.; and witness replied that the Manager of the Company gave evidence before the Committee, but there was no charge against them, or allegation that they did not use their powers to the best advantage as far as the public were concerned, and therefore the Company were not tried at the bar. Besides the Manager, the late Sir Courtenay Boyle, of the Board of Trade, and Mr. Haward, of the London County Council, put the circumstances of the Commercial Company before the Committee; but the name of the Company was never mentioned in the report, except as a standard of comparison. He did not, however, suggest that the Company were outside the report of the Committee. When the Committee made their definite recommendation as to the reduction of the standard price, he did not think they had the Commercial Company in mind. The Company, under their Act of 1875, came under the sliding-scale, but were not put under the auction clauses. The result was that shares were allotted at par, which were considerably over par in the market. The district of the Company was poor; but since 1877 they had always divided over 10 per cent. on the 10 per cent. stock, and over 7 per cent. on the 7 per cent. stock. The Company, however, had never taken full advantage of the sliding scale.

In re examination, witness said that in 1875 the Company obtained a certain amount of capital power from Parliament in the expectation that the district would continue to develop at the same rate as it had been progressing. But that did not occur, and thus the capital lasted much longer than was expected.

Mr. *H. E. Jones*, examined by Mr. BAGGALLAY.

Witness said that the general intention of the Bill was to follow the recommendations of Sir James Rankin's Committee; making some variations where necessary, owing to the special conditions of the Company. The Commercial Company was classified with the two larger Companies by that Committee. But this was a great disadvantage, because the district of the Commercial Company was in no sense Metropolitan; being nothing like as good as the district of the Wandsworth and Putney Company, which was Suburban. The great distinctions were in the character of the district and the smallness of the Company as compared with the South Metropolitan and Gaslight and Coke Companies. In Mr. Haward's statement on behalf of the London County Council before Sir J. Rankin's Committee, there was not a word regarding the Commercial Company, except of commendation of their conduct in comparison with that of the Gaslight and Coke Company. In the whole of Mr. Haward's evidence, there was not a sentence reflecting on the Commercial Company. The South Metropolitan Company had always been in a better position than the Commercial Company. From 1868 onwards, the South Metropolitan, as compared with that Company, had had an advantage of about 4½d. in the cost of manufacture of gas. All through except in 1890, the cost of coal to the Commercial Company was in excess (and sometimes much in excess) of the cost to the South Metropolitan Company. The results throughout for residuals had also been lower than in the case of the South Metropolitan Company.

Thursday, March 13.

On the assembling of the Committee to-day,

Mr. DU CANE said he had been instructed to appear on behalf of the Board of Trade, to represent the public interest. The Bill had reference to the testing of gas; and he was instructed not to offer any opinion with regard to the Bill, but merely to watch the proceedings on behalf of the public, and to offer to the Committee every assistance, either through himself or the Gas Referees, which they might desire.

The CHAIRMAN: The Board of Trade have made no report on this matter at all, have they?

Mr. DU CANE: No.

Mr. *H. E. Jones* was further examined by Mr. BAGGALLAY.

Witness first directed attention to the disabilities under which his Company worked, compared with the South Metropolitan Company. First there was the small scale of the works, which accounted for about 1d. per 1000 cubic feet; the smallness of the works not enabling them to use labour-saving machines to their full power—the increments in the demand were too small to enable the Company to put in as a single unit the large number of retorts necessary to fully employ one of these machines. Then there was the absence of the usual element of trade owing to the district being filled and to industries having departed. Another disability was the fact that the whole of the district, with the exception of an insignificant part, was covered by electric lighting undertakings in the hands of Local Authorities. Then the necessity of barging coal at two of the works meant an extra charge, which, averaged over the whole output of the Company, he calculated to amount to 1·7d. per 1000 cubic feet. Further, he explained how exceptionally unfortunate the Company were in the matter of the sale of their coke owing to the competition of the Gaslight and Coke Company. This extra competition made a difference of at least ¾d. in the cost of production. These various disabilities had unfavourably affected the price of gas in the case of the Commercial Company to the extent of 4½d. per 1000 cubic feet. The growth of the Company from 1875 to 1898 was only 126½ per cent.; whereas in the case of the South Metropolitan Company the growth was 241 per cent. Between 1883 and 1898, the progress of the Commercial Company was 50·9 per cent.; whereas that of the South Metropolitan Company was 121·7 per cent. The present sale of gas by the Company was 2650 million cubic feet per annum. The maximum day's supply was 14¾ million cubic feet; and the works were now equal to an output of about 14 million cubic feet of coal gas, and 2½ million feet of water gas. If the Company had erected machinery for coal gas production equivalent to the production of this quantity of water gas, they would have raised the capital by about £300,000. With regard to the extra capital sought, as to £120,000 it was to improve coal transport, and to place better appliances in the works. For further storage capacity for 3 million cubic feet, £22,500 was needed, and £10,000 for more purifiers. To replace what was practically an illegal loan by the bank, £100,000 was required at once; and for working capital during five years £130,000 would be necessary. He assumed that the increase in the consumption would be at the rate of 2¾ per cent.—the smallest increase ever spoken of in connection with a gas undertaking; and on this basis, at the end of five years the Company would be selling 400 million cubic feet more than they were in December last. At £400 per million cubic feet, which was rather less than the present capital, this meant £160,000. He believed the bulk of the demand would come from the working classes in connection with slot meters; and therefore he added another £120,000 to meet the extra cost which would be incurred for fittings, &c. Allowing £40,000 for 20 acres of land, at £2000 an acre, brought the total requirements for the five years to £602,500. The new capital proposed by the Bill was £500,000; but there was unissued capital power possessed by the Company of about £89,000. In regard to the reduction of illuminating power and of the price of gas, the proposal followed that of the South Metropolitan Company. In order to minimize the difficulty which would result at first from the supply of gas of lower illuminating power, the Company had undertaken to supply burners free. With regard to testing, the Company had the best known and most approved form of apparatus at present known.

In cross-examination, witness said they did not propose to supply governor burners free. He believed the South Metropolitan Company had found it expedient to make some sort of arrangement with the County Council to supply a rather better burner than they were obliged to give. Whatever that Company had agreed to, the Commercial Company would agree to. He accepted the suggestion of Counsel that in the last five years they had only spent £200,000; in the previous five years, £64,000; and in preceding five years, £56,000. The reason they had not expended capital more rapidly was that, soon after obtaining their Act in 1875 authorizing fresh capital, their district was affected by great stagnation of business. It was very meritorious of the Company to make the capital last so long, because it was thought it would last only twelve years. In regard to the recommendation of the Select Committee that the standard price of the Metropolitan Company should be reduced to 3s. 3d. to carry the standard dividend of 10 per cent., he did not deny that the Commercial was a Metropolitan Company; but they were very different from the other two Companies. If the report of Sir James Rankin's Committee were carried out, it meant little short of disaster and ruin to his shareholders; and he hoped no Committee of Parliament would adhere strictly to its recommendations. It was put to witness that the fact of the Company not having been placed under the auction clauses had enabled them to put £200,000 into the pockets of their shareholders; but he explained that the Company were the first to adopt the sliding-scale, and it was because of this that they were given capital powers without the imposition of the auction clauses. Before Sir James Rankin's Committee, he said that the consumers had been prejudiced to the extent of 1½d. per 1000 cubic feet in the price of gas by not coming under these clauses. That, however, was a rough calculation he made while under examination. Shortly after the report of the Committee, the Company voluntarily put themselves under the auction clauses.

Mr. WILKINSON: With regard to testing, I suggest that 14-candle power gas should be tested by an apparatus in which the gas is burnt at a rate to give a light of 14-candle power instead of 16-candle power.

Witness: The clause is drawn to follow the lines of the South Metropolitan Bill. We were anxious not to trespass a single inch outside the precedent. I think the clause as it stands is a very fair and proper one.

What you propose is to compare a flame of 14-candle power with one of 16-candle power. Is that right?—We have a 16-candle power standard.

The point of what I suggest is that 14-candle power gas, when tested as against 16-candle power gas, makes it appear that 14-candle power gas is 15-candle power, and 13-candle power gas is 14-candle power?—I had no such knowledge. I should think it very unlikely. It is the sort of thing the London County Council are always saying to us.

As to the conversion, do you propose in your accounts to show the effect of the conversion?—Yes; there is no objection to that. You can have the sum of money nominally added shown.

Would the effect of conversion be to raise the capital value of your concern, and so to benefit the shareholders?—I do not know.

Would it add to the saleable value?—I think the average investor might like a moderate dividend better than a high one.

By Mr. DU CANE: Roughly, he should say that rather more than half of the Company's gas was used at such hours as led him to think it was not employed for lighting purposes; and the quantity of gas so used was increasing very rapidly.

In re-examination, witness said, in estimating future capital requirements, it was fallacious to only consider the expenditure in the past.

If the standard price were reduced so low as to affect dividends, the effect on the issue of share capital would be that, instead of getting a premium on money, which would bear no interest, capital might have to be issued at a discount.

By Mr. TREVELYAN: If the standard price of the Commercial Company were reduced by 6d., the actual reduction in the case of the South Metropolitan Company being only 3d., the Commercial Company would be placed at a disadvantage. He agreed, however, that the dividends of the Commercial Company had recently been about ½ per cent. higher than those of the South Metropolitan Company.

Mr. TREVELYAN: Does not the higher dividend you have earned about represent the advantage which you have in the standard rate over the South Metropolitan Company?

Witness: No; the 3d. to meet that would be ¾ per cent. all the way through.

The CHAIRMAN: If the statement of the County Council is correct, and the effect of testing in the way proposed in the Bill is to give a wrong impression, you would not have any objection to alter it, would you?

Witness: We are venturing on new lines; and we have adopted the South Metropolitan precedent.

Supposing, for argument's sake, the South Metropolitan Company are wrong?—If they get under their Act an advantage not due to the alteration (if in their proposition they do not give all that was expected), I should say that was unfortunate; and that if there was any fictitious advantage, Ido not think we ought to claim it.

Mr. *George Livesey*, examined by Mr. SNAGGE.

Witness said the Company required additional capital to carry on their work, though he thought the details had better be dealt with by the Engineer. Speaking from his own experience, he considered that the sum asked for—£500,000—was a reasonable and proper amount, having regard to the future requirements of the Company. They were considerably in arrear, through not having had cheap capital in the past to extend their business. He was well acquainted with the recommendations of the Rankin Committee. He thought he might say that the recommendation that the initial price should be reduced to 3s. 3d. in the case of all the three Metropolitan Companies, was not directed against either the South Metropolitan or the Commercial Company. It was really directed against the Gaslight and Coke Company. The recommendation of the Rankin Committee was that there should be a uniform standard price for the three Companies. If the recommendation were carried out, it would operate unfairly towards the Commercial Company. No fault was found with the Company before the Rankin Committee; and to put them in the same category as the Gaslight and Coke Company was rather unfair. If the initial price of the Commercial Company were reduced by 3d.—that was to say, to 3s. 6d.—the shareholders would, by the additional increments of dividend under the Rankin recommendation, get the same dividend as at present when the selling price came down to 2s. 9d. If, however, the initial price were reduced by 6d., the shareholders would not get the same dividend as at present until the price was reduced to 1s. 9d. This would be a rather unfair penalizing of the Company; and he did not think the Rankin Committee intended it. Under present conditions, 1s. 9d. was an impossible price. The proposal of the Rankin Committee, as he read it, was to impose a penalty on the Companies who charged a high price for gas, but to let them get their ordinary dividends when they reduced their price to a reasonable extent.

Mr. SNAGGE: Is it a fact that the consumer gets 5-6ths and the shareholder 1-6th of saving resulting from every economy effected?

Witness: Yes. If there were no reduction in the initial price, the shareholder would get no advantage.

What amount would the consumer get from the reduction of 2d. per 1000 cubic feet?—Rather over £20,000 a year.

Dealing with the question of illuminating power, witness said that for many years it had been the practice, when gas companies came before Parliament, to petition for an increase in the illuminating power of the gas supplied. The illuminating power had consequently been increased. In the old days, this was of no consequence, because cannel coal was cheap; and the admixture of a small quantity of cannel with ordinary coal had the effect of enriching the gas. When cannel coal became dear, petroleum spirit was used in its place; but this did not prove to be satisfactory. The only other method employed was that of mixing carburetted water gas with the coal gas. There were also objections to this plan, and it was uncertain, because it was very difficult to mix gases equally. Two years ago, Parliament acceded to a request made by the South Metropolitan Company that they should be allowed to reduce the illuminating power of their gas to 14 candles. There was a great deal of opposition to the proposal; but it passed. The Company were not going to stop at 14 candles. Gas would have to be made and supplied at a considerably lower illuminating power than that—perhaps 8 or 9 candles, or even less. Since the introduction of the Welsbach system of lighting, there had been no necessity to have a high illuminating power in the gas itself. The South Metropolitan Company arranged to make a reduction of 1d. per candle in the initial price. This meant that, if they reduced the power by 2 candles, the Company, in order to be in the same position as before with respect to dividend, would have to reduce the selling price of gas by 2d. This meant £90,000 a year to the South Metropolitan Company. The reduction in illuminating power was made last year, and the consumers got the £90,000. The Company, however, had not benefited to this extent; and so at present they were absolute losers by the transaction. The Commercial Company would be in no better position to save by such a transaction than the South Metropolitan Company; but he was not going to ask for any different arrangement in their case to that made in the case of the South Metropolitan. The Commercial Company were quite prepared to accept what was given to the South Metropolitan Company—that was to say, the same figure per candle. One of the allegations made by the opponents of the reduction of candle power by the South Metropolitan, was that the consumer would have to use 15 to 20 per cent. more gas in order to get the same light. The Parliamentary Committee did not take this view; and practical experience had shown that it was a mistaken view. The South Metropolitan Company reduced the quality of their gas from 16 to 14 candles last June. During the last half year, it had not got down to 14; but it had got as low as 15. If the contention of the opponents of the change had been right, there would have been a large increase in the consumption of gas. As a matter of fact, there had been no increase whatever beyond the ordinary normal rate. The South Metropolitan Company had as neighbours the Crystal Palace Gas Company, who had had about the same normal rate of increase. From June, 1901, when the South Metropolitan Company reduced the illuminating power the consumption had increased 6 per cent.; and the Crystal Palace Company had shown almost exactly the same rate of increase. The figures in one case was 6·4 per cent., and in the other 6·7 per cent. He thought this was pretty conclusive evidence that, as far as the consumers were concerned, the lowering of the quality had not made an atom of difference to them. Of course, the Crystal Palace Company had maintained the same quality of gas all through. Then there was evidence of the complaints. A great number of complaints were received by all gas companies of bad lights. A good many of them were due to stoppages by naphthalene. He had had the complaints numbered; and he found that, excluding the case of naphthalene stoppage, from June to December last there were fewer than the average.

Mr. SNAGGE: Will you tell us what effect the different burners have on the gas?

Witness: The illuminating power is a matter of no moment whatever; it is entirely in the hands of the consumers to get what quality they like out of the gas. In the case of ordinary London 16-candle gas, one gets 16 candles by a consumption of 7 feet an hour; the best of the flat-flame burners will give about 3 candles of light per foot of gas burning; the inferior flat-flame burners, of which a large number are in use, do not give 1½ candles; the regenerative burner will give 6 candles; the London argand gives 3 candles; the old Welsbach gave 12 candles; the improved Welsbach give 24 candles. The Welsbach system, under pressure, gives 30 candles per foot.

Has it been found that with 14-candle gas the Welsbach mantle gives a better light than with the 16-candle gas?—Yes. I ought to explain that the Welsbach burner first of all destroys all the illuminosity of the gas, as it is a bunsen burner. The South Metropolitan Company undertook to supply suitable flat-flame burners free to all consumers when they lowered the quality of the gas. A good many asked for them; and hundreds of thousands of burners have been supplied by the Company.

Have you seen clause 13 of this Bill, which deals with the burner for testing the gas?—Yes.

Do you approve of the burner there suggested, and the rate at which the gas should be tested?—Yes; I do. I think it would be the only fair thing. I am speaking of the clause providing that the gas should be burnt in a standard burner giving a light equal to 16 candles, and that the chimney should be used as prescribed by the Gas Referees for an illuminating power of 14 candles. The London argand is the only standard burner for testing gas throughout the country. There is no 14-candle standard in existence.

As to the proposed reduction in the standard price of gas, from your knowledge of the Commercial Company's district, do you consider that they can produce gas as cheaply as the South Metropolitan Company?—No; I used to regard the Commercial Company as the only rival of the South Metropolitan Company in London. In the eighties, they ran us very close indeed; and in one period of three months, they sold gas at a lower rate than we did. The South Metropolitan Company have had a large area of unoccupied land, and an enormous extension has taken place there the last twenty years. The Commercial Company have had no extension at all. The South Metropolitan Company can increase business without a proportionate increase of capital. They had doubled their business in the last twelve years; but they had not doubled their capital, or anything like it. In order to pay our full dividends in 1889, we required 1s. 0½d. per 1000 cubic feet sold; whereas in 1901 we required only 7½d. That has given us an advantage of 5d. over the Commercial Company, and simply because they have not had the opportunity of expansion.

In cross-examination by Mr. WILKINSON, witness said that the Commercial Company were not one of the Companies incriminated before the Rankin Committee. They were included in the terms of reference to the Committee; but he did not think that their circumstances and conditions were fully before the Committee.

Mr. WILKINSON: As to the burner with which you propose to test gas of 14 candles, I tell you at once that the point I want to bring out is that 14 candle gas ought to be tested against gas which is burnt at such a rate as to give a light equal to 14 candles, and not 16.

Witness: Well then, you must make a new standard burner.

Will you tell me this—If you compare 14-candle gas with a gas burnt at a rate which will give a light equal to 16-candle gas, does that produce the same result as comparing 14-candle gas with gas burnt at such a rate as will give a light equal to 14 candles?—If you burn gas in the standard burner to give a light of 16 candles, you will show our gas to be equal to 15 candles; but if you burn it in the standard burner to give a light equal to 14 candles, you will give a light equal to 14. That will make a difference of 1d. to our disadvantage, and will be unfair to us. We want to apply the same standard foot-rule; you want to alter the foot-rule.

The Gas Referees prescribe the mode of testing?—Yes.

As a matter of fact, do you know whether they have approved of testing 14-candle gas against gas burnt at a rate which will give 16-candle gas?—I know nothing about the Referees.

In re-examination by Mr. BALFOUR BROWNE, witness said that the standard burner was made to test gas of 16 candles; and if the gas were below 16 candles, more must be burnt.

By the COMMITTEE: When the price was reduced to 2s. 6d., under the new scale, they would be able to divide the same dividend as they had previously divided when they got down to 2s. 9d. The object of the recommendation of Sir James Rankin's Committee, that the standard price should be reduced, was to secure more care and economy; but the utmost care and economy was already exercised by the Company. They had been for many years working at the very lowest possible point; and one of their great difficulties had been to keep the price down as low as it had been kept. If they were to have the same dividend under the reduced sliding-scale proposed by the

Select Committee, a further economy of £36,000 would have to be effected; and that would be a very difficult thing to realize. The Commercial Company had for some time been able to divide in many cases ½ per cent. more than the South Metropolitan Company.

The COMMITTEE: Does not that represent their advantage in having a standard 3d. easier than yours?

Witness: Well, they have been able to pay a higher dividend because they have a higher initial price, no doubt; but I believe they have always paid within ¼ per cent. up to the hilt. The South Metropolitan Company have not.

Sir *Frederick Bramwell*, examined by Mr. BALFOUR BROWNE.

Witness was well acquainted with the district of the Company and the sites of their works. There was no power whatever of extending their area; and the present district contained a great deal of unremunerative space, such as the docks, the cemetery, and Victoria Park. There were exceptional circumstances which made it impossible for the Commercial Company to manufacture as cheaply as the South Metropolitan Company. Thus, at only one of their stations could coal be economically brought to the retorts. In fixing the standard price, the condition of the Company, and the circumstances of the times, should be considered. Having considered these things, he had come to the conclusion that the standard price proposed, comparing it with the South Metropolitan standard price, was fair. As to the reduction in illuminating power, in his view cheap gas was very much more important now than highly illuminating gas. He had a very good opinion of the value of gas-engines; and a prophecy which he had made 21 years ago, as to the future of gas as motive power, had been largely fulfilled. In the interests of persons using power, and in the interests of our coal stores, it was highly desirable that gas-engines should be substituted for steam-engines. Gas-engines to a large extent had superseded steam-engines; and during the last five years progress in this direction had been enormous. Instead of being applied to engines of 5 and 10 horse power, it was now applied to engines of hundreds and even of a thousand horse power. London coal gas was good for driving engines; but it was very dear. The question of illumination now was merely a matter of burner. If used in proper burners, a very large amount of illumination could be obtained from a low illuminating power gas.

In cross-examination by Mr. WILKINSON, witness said that he should think the first recommendation of Sir James Rankin's Committee, that the price should be reduced to 3s. 3d., referred to all the Metropolitan Companies; but all the circumstances should be considered before that reduction was made.

The CHAIRMAN: Have you gone into the question of the amount of capital this Company are proposing to raise?

Witness: I have not gone into it in detail; but, generally, I say it is reasonable. To begin with, they have this heavy overdraught of £80,000; and then the coin-meter establishments (their only source of increase) involve a very heavy outlay.

Asked what was the relative cost of gas and steam for driving engines, witness made a rough calculation, and stated that the cost of gas would be 1¼ or 1⅜ the cost of steam.

Mr. *W. H. Y. Webber*, examined by Mr. BALFOUR BROWNE.

Witness had carefully studied the matter of the illuminating power of gas and was familiar with the Bill. This was not merely the difficult question of taking off 1 candle or 1½ candles or 2 candles, but the proposal would go down to the bed-rock of coal-gas making; and with the best, cheapest, and most plentifully rendered available material, it lay at the very root of the future prosperity of the gas industry, and the satisfaction of the public with it. Therefore, it was not only a matter for the Company, but was far more a matter for the consumers, because the Companies could get their dividends with any quality of gas. The public demand was practically to turn coal gas into fuel gas; the light being obtained from the heating of a mantle—the fuel value of the gas, not its nominal illuminating power. It had now been discovered that there was no connection whatever between the illuminating power of coal gas as tested in the photometer, and the amount of light it was capable of yielding from an incandescent burner; that was really the charter of cheap gas in the future.

Mr. BALFOUR BROWNE said Counsel for the opponents had just informed him that they were not objecting to this part of the Bill, and, therefore, it would not be necessary to go any further into it.

In cross-examination by Mr. WILKINSON, witness said the result of using welsbach burners would be to reduce the amount of gas consumed in the district—the Welsbach burner consuming less gas per burner than the ordinary burner.

By Mr. BALFOUR BROWNE: If the gas were employed as fuel, the quantity used need not necessarily be less. He thought it would be much more.

Mr. BALFOUR BROWNE: That is the case for the promoters.

Mr. DU CANE at this point offered to put one of the Gas Referees into the chair for the information of the Committee.

Lord BALCARRES: Whose case is the Referee going to represent?

Mr. DU CANE: The Board of Trade and the public interest.

Lord BALCARRES inquired whether there were no bodies representative of the district concerned?

Mr. DU CANE replied in the affirmative, but said this was a matter which touched the Board of Trade and the Gas Referees in the execution of their duty.

Mr. BALFOUR BROWNE: It is well understood that no Government Department have any right to appear here, except in the ordinary way by petition.

Mr. DU CANE: Our position is that we desire to offer any assistance which the Board of Trade can render.

Lord BALCARRES: We have the power to send for that assistance at any time.

The CHAIRMAN: Would you tell the Committee exactly what special point the Board of Trade want attention directed to?

Mr. DU CANE: The Board of Trade appoint the Gas Referees, who prescribe the method by which the gas shall be tested. This Bill proposes, by clause 13, to alter one of the most important details determined by the Gas Referees. That is a matter which the Referees have hitherto dealt with; and it may so happen that, in the opinion of the Referees, the test would not be an efficient one. I believe it is the view of the Referees that, in order to test gas of a certain candle power, it should not be consumed at the rate prescribed by the Bill.

Mr. BALFOUR BROWNE: My learned friend has not asked a single question of the witness on the point.

Mr. DU CANE: That is owing to the position I took up. I was instructed not to express an opinion, but to offer any assistance which the Board of Trade could afford, in order that the Committee might be able to give a decision on the point raised in clause 13.

The CHAIRMAN: Have you ever appeared in a similar capacity before any of the Committees—on the South Metropolitan Bill?

Mr. DU CANE: The Board of Trade did not appear when the change was made by the South Metropolitan Company; but that was a lapse which I hope will not be held to bind the Board of Trade, either in this case or in other cases.

Lord BALCARRES: You have already lapsed by omitting to give notice that you intended to oppose this Bill in the public interest.

Mr. DU CANE: I do not think the Board of Trade are called upon to petition in a case of this kind. We are not seeking to oppose the Bill. We are simply desiring to assist the Committee, if they desire assistance.

The CHAIRMAN: I think this is a very important question which has arisen for the first time; and I think we may very well postpone our decision till to-morrow, by which time I shall have had an opportunity of consulting with the learned Counsel to the Speaker and the Chairman of Committees.

The case of the London County Council was then proceeded with.

Professor *Clowes*, examined by Mr. FREEMAN.

Witness said the method of testing proposed was certainly an incorrect one. It was introduced in the South Metropolitan Bill of 1900, but without the Gas Referees being in any way consulted.

Mr. FREEMAN: Do you see any reason why in this Bill, and for this Company, the Gas Referees should not prescribe the same method of testing gas as they do in other cases?

Witness: Certainly not. I have made a long series of experiments with 16 and 14 candle power gas, and the average result was that when 14-candle power gas is tested as proposed to be prescribed by the Bill, it gives a reading on the photometer of 15 candles. That is to say, the actual indication given by the photometer is 1 candle power more than that possessed by the gas. The practical result would be that the Company who were allowed to reduce their candle power from 16 to 14 could, if they chose at the lower limit of 14 candles, supply 13-candle power gas, which would appear as 14-candle power.

In reply to further questions, witness said the appliances for testing were constantly improving, and it should be left to the Referees, the appointed authority, to prescribe the apparatus which gave the best test, and to prescribe the manner of using that apparatus. To obtain the necessary accuracy, for the word "sixteen" in the clause should be substituted the word "fourteen." That would make it satisfactory for testing 14-candle power gas. But a better plan would be to strike out the whole clause, which would leave it to the Gas Referees to prescribe the method of testing.

Do you see any reason why you should take away from the Referees by this particular clause the power which they have in other cases?—It does not seem right to me that a body appointed by the Government should not be consulted.

Can you see any reason why they should have any special clause at all?—Certainly not.

Continuing, witness said that clause 14 should be amended, so as to allow of the consumers being supplied with a burner within one year of the passing of the Act; and the burner supplied must be a suitably governed burner.

In cross examination by Mr. BAGGALLAY, witness said the 14-candle power gas which he used in his tests was obtained by depriving the higher illuminating gas of some of its power. The present standard of the South Metropolitan Company was 14-candle gas; but they were giving 15-candle gas according to the standard they chose to adopt. Either the testing clause should be struck out, or 16 should be substituted for 14. The matter was not raised in the South Metropolitan Bill owing to inadvertence. Governed burners were being supplied by the South Metropolitan Company at the low charge of 2d. each. The Company supplied ungoverned burners free. He would much prefer that the people should be supplied with governed burners free.

The CHAIRMAN: Would you rather have the public paying for them than not have governed burners?

Witness: Yes.

Mr. BAGGALLAY: We are willing to give them a free burner; but if they want a governed burner, we are willing to supply them at a small charge.

Witness: I think it would be advantageous to the public to have a governed burner, because the ungoverned burners lead to a very extravagant consumption of gas.

Lord BALCARRES: Can you detect any substantial injury done to South London by the South Metropolitan Company having obtained a clause which the Commercial Company are now asking the Committee to grant?

Witness: The damage done to the consumer is that he can be supplied with 13 instead of 14 candle gas; and he loses therefore a certain amount of the illuminating power.

Is that happening now?—I believe it is not. I believe the South Metropolitan Company have actually maintained up to the present time the standard of about 15 candles. I believe they have not been able to work down to 14 candles, and therefore they have to supply 15-candle gas.

Professor *Vivian B. Lewes*, examined by Mr. FREEMAN.

Witness said, in his opinion, there was no possible reason for interfering by legislation with the general powers of the Gas Referees, who could easily prescribe conditions for testing 14-candle power gas. He agreed that a governed burner would give a better result than an ungoverned burner.

In cross-examination by Mr. BAGGALLAY, witness said the effect of substituting 14 for 16 in regard to the candle power in the Bill would be to give a result probably nearer 14 than if the figure were left 16; but he was not sure that the chimney of the testing apparatus ought not

to be slightly altered. For the Gas Companies, and for the public also, he felt strongly that the proper thing was to put this matter into the hands of the Gas Referees, the proper authorities to deal with it.

Mr. BAGGALLAY: In practice, how can the proposals made in clause 13 in any way increase the illuminating power of the gas above what it is in fact?

Witness: Because you are burning gas under conditions of rate of flow and of air supply which you had not the burner designed for. If you want to make the London argand a standard for all powers of gas, you can do so. You can do so by burning the gas at such a rate as to give a constant 3-inch flame in the chimney. Clause 13 would not alter the present position. The first part of the clause would make provision for testing 15-candle gas by applying to it the provisions which now, with necessary modifications, were applied in the case of testing 16-candle gas; and the result was that there would be an error of importance. The second part of the clause related to the test for 14-candle gas; and he thought it meant that they were to use the table photometer and the burner which was fitted for 15-candle gas, and the chimney which had been prescribed for 15-candle gas—or 14-candle gas with an open bar photometer—and that, he thought, would not meet the case. The whole matter should be left to the Referees, by omitting the clause. What was fair in regard to the suggestion that the Company should not only supply and fix ordinary burners free, as they were willing to do, but that they should also provide governed burners free of cost, was really a question between the Company and the consumers. He thought, however, it would be greatly to the advantage of the Company to give governed burners, because, though they would cost more initially, they would give a much better effect with gas than ungoverned burners, and so make it worth while to adopt them.

Friday, March 14.

Mr. DU CANE said he wished to make a short statement with regard to the position which he took up, or sought to take, the previous day. The Gas Referees had observed the proposal in the Bill with reference to testing; and seeing it was a highly technical matter, they felt that they ought to put themselves at the disposal of the Committee. With a view of doing that, they approached the Board of Trade to know whether they might have the usual assistance in putting their views before the Committee, if the Committee desired to hear them. They had no desire to take up a position either for or against the Bill.

The CHAIRMAN said since the adjournment he had had the advantage of consulting with the Speaker's Counsel and Mr. Bonham Carter, who agreed that, as there was no petition against the Bill, either by the Referees or the Board of Trade, and no instruction from the House asking the Chairman to call the Referees before them, they must decline to hear them. There was no precedent for such a course.

Mr. DU CANE: I ought to have pointed out that, in the case of the London County Council's Bill, which was known, I think, as the Photometer Bill, the Committee sent for Mr. Vernon Harcourt, one of the Gas Referees.

Lord BALCARRES: That case was precisely the reverse of the one before us now.

Mr. *H. E. Haward*, examined by Mr. FREEMAN.

Witness said the position of the London County Council with regard to the proposed conversion of capital was that they did not think it advisable in the public interest; but as it had been sanctioned in the Gaslight and Coke and South Metropolitan Companies Acts, they were not prepared to oppose it on this occasion. The Council wished to point out that undoubtedly such conversion would give an additional saleable value to the stock of the Company—it would be more marketable; and in that respect the shareholders of the Company would derive some benefit. In this case, the advantages of the suggested conversion would not be so great as in the South Metropolitan and Gaslight and Coke Companies, because in those cases there was also a large measure of consolidation. There was no consolidation here; the Company proposing to retain the 7 per cent. stock in its present relation to the 10 per cent. stock. By the conversion, the real rates of dividend paid on the invested capital would be rendered obscure. In future, it would appear that the Company, instead of receiving 13 per cent. dividend, would receive something like 5 per cent. only; and the London County Council did not consider that that was in the public interest. The variation of price and standard dividend was very fully gone into before the Select Committee of 1899. It was suggested that the Commercial Company were not very much concerned with that Committee; but a large part of the evidence witness gave before the Committee was directed to showing that the three Metropolitan Companies generally had benefited enormously under the arrangements made in 1875 and 1876. He pointed out to that Committee that prior to that time, the Companies could only divide 10 per cent. Since then they had been able to divide very large extra dividends, which had amounted to some £3,000,000, of which the Commercial Company had had about £500,000. That was to say, in the last 25 or 27 years they divided that sum in addition to what they would have divided if left under the arrangements which existed prior to 1875. In consequence of issuing capital at par, the Commercial Company had unnecessarily issued £200,000 of capital in the last 25 years. If they had issued the capital at the market rate, they would have been saved the necessity of issuing £200,000 of capital; and that would have enabled them to reduce the price of gas. He saw no reason why a standard price should be fixed in the case of this Company different from that of the other two.

Mr. FREEMAN: Do you think it desirable that uniformity should be observed?

Witness: I think that was the object of the Select Committee. The Commercial Company, although they claim to have a rather poor district, have been able to pay something like ½ per cent. dividend more than the South Metropolitan Company for a number of years.

Have you formed any conclusion as to how far they must reduce the price of gas, if this alteration were made, to earn the same dividend as they are paying now?—I do not think it is necessary to make a calculation. The present price of gas supplied by the Commercial Company is 2s. 8d.; and at that price they are entitled to divide £5 6s. on the original capital as converted. If they reduce the price to 2s. 5d., they will be entitled, on the sliding-scale of Mr. Oldroyd's Committee, to divide £5 6s. 8d. We know that for five years prior to 1900 they were charging only 2s. 6d., and the present price is capable of reduction; and we hope in the near future it will be reduced.

Continuing, witness said he wished to point out that, under the present Bill, the Company would get more dividend than they were actually receiving at present.

Mr. TREVELYAN: Who drew up the system of sliding-scale beginning at 3s. 6d.?

Witness: That is the Company's proposal in the Bill.

Mr. FREEMAN: What we are asking is that the proposal of the Committee of 1899 which prevails with the other Companies should prevail in this case. The promoters have adopted the second part of the recommendation of the Committee, which is in their favour, and left out the first part, which says the standard price shall be 3s. 3d.

Witness, in further examination, said what the Company were asking now was to increase their capital powers by 46 per cent. He contended that, by the recommendation of the Committee of 1899, the Company should only have what they required for five years. The expenditure of the Company for the last five years worked out at about £200,000, and that particular period of five years was one in which they incurred a great deal of expenditure, because it saw the development of the slot-meter business. The only possible increase that could arise was from working people adopting slot meters.

The CHAIRMAN: Also from demands for machinery and cooking purposes?

Witness: But against that you have the Stepney Borough Council and the Whitechapel Borough Council, who have just started electric lighting undertakings and are making tremendous efforts to secure business; and also the introduction of the Welsbach system of lighting, which obviously tends to reduce the consumption.

Mr. MOON (interposing): On behalf of the Company we should be prepared to accept what we may describe as a lapsing clause—that if the capital asked for in the Bill is not required within the five years, we should have to come back at the end of that period to ask for fresh capital if we wanted it. That seems to me to carry out indirectly the recommedation of Sir James Rankin's Committee.

Witness: I do not quite understand how a clause could be framed to give effect to that proposition.

Mr. MOON: It seems to me that if any of the capital powers in the Bill are not to be exercised after five years, it will have that effect.

Mr. FREEMAN: No; not necessarily, because you might construct works in the first two years which might last for fifteen years.

Witness, in further examination, said he estimated the sum the Company would require in the next five years at about £200,000, with a further £50,000 for a balance in hand; but he thought that the Council would not oppose their having £300,000.

In calculating what the requirements will be, is £400 per million cubic feet of gas sold the usual calculation?—That is the calculation which has been mentioned, and I think the calculation Mr. Livesey adopted in the case of the South Metropolitan Company three years ago. Some point has been made by the Commercial Company that they require more capital, because of the requirements of the slot-meter business; but Mr. Livesey's increase is very largely made up of slot-meter business, and he only asks for £400 per million cubic feet.

Cross-examined by Mr. MOON, witness said the County Council had not had any representations from the districts the Company supplied. Both the districts concerned were purveyors of electric light. He thought the question of the reduction of the standard price was distinctly raised before Sir James Rankin's Committee of 1899; but he could not point to any specific suggestion of the kind. Still, as a result of the evidence given by the County Council, that the gas companies had benefited to an enormous extent by the sliding-scale—far more than was ever expected in 1875—the Committee came to the conclusion that the standard price should be reduced to 3s. 3d. When the sliding-scale was applied in 1875 and 1876, a standard price of 3s. 9d. was applied to the Commercial Company, whose maximum price was 3s. 9d., and a standard price of 3s. 6d. was applied to the South Metropolitan Company, whose maximum was 3s. 6d.; but all these facts were before the Select Committee. On being pressed, witness agreed that a Company whose cost of manufacture was higher than that of another Company would be entitled to some little consideration in the fixing of the initial price. He thought the fact that the Commercial Company had been able to pay 13¾ per cent. dividend for many years would have an important bearing on the matter.

Counsel read a number of extracts from the evidence which the witness gave before Sir James Rankin's Committee, with the object of showing that he had there indicated that the district of the Commercial Company was a much poorer one than that of the South Metropolitan Company, and that the position of the Commercial Company generally was not so good a one.

Witness, however, said the main point the Counsel had to sustain before that Committee was the impeachment of the management of the Gaslight and Coke Company; and he was prepared to say that he made no attack on the Commercial Company. The allocation by the Commercial Company of capital at par constituted an additional reason why they should reduce the standard price more than 3d.

Mr. MOON: Have you ever known a single case in which the initial price once fixed by Parliament—on which capital has been raised—has been altered?

Witness: The South Metropolitan Company.

With their own consent, and with compensatory conditions?—They adopted the recommendations of the Select Committee.

Have you known a single case in which, against the will of the Company, the standard price has been altered?—I believe there have been cases.

Mr. MOON: I am aware of one; and I make a present of it to you—the Lea Bridge case. That was a case in which the management was alleged to have been extremely bad, and the price of gas was kept up to a high figure in consequence.

In further cross-examination, witness said they must consider the two standard prices on the scale of the 16-candle power gas. It was estimated that the reduction of the illuminating power from 15 to 14 candles would enable the Company to knock off 2d. in the selling

price. If they did that, they would be selling gas at 2s. 6d. per 1000 cubic feet. On that basis, they would be able to divide £5 6s. 8d., which was 8d. more than at present.

Mr. MOON: I think that is right, so that there would be a trifling advantage in adopting Mr. Oldroyd's scale.

Witness: A trifling advantage at the present time; but a much larger advantage as you get the price of gas lower down the scale.

Mr. MOON: I quite agree; and that is an economy by which the consumers benefit?

Witness: I do not think that is necessarily so.

In further cross-examination, witness said the Company adopted a peculiar system, by living very much on temporary loans; but because of that they would not want more working capital—they had some capital unissued now.

By Mr. TREVELYAN: In the years from 1886 to 1899, with the exception of 1893, the Company would have been able to divide a higher dividend if they had had the sliding-scale they are now asking for.

By Lord BALCARRES: He thought some of the items forming the £600,000 which Mr. Jones had said the Company would require were given twice over. Thus, about £120,000 for improvement of transport and better appliances and storage, &c., would be included in the general figure of £400 per million cubic feet. The point of the County Council was that the Company should not be able to go away from this Committee with such a large amount of capital powers as would render it unnecessary to come to Parliament for ten or fifteen years.

Mr. BALFOUR BROWNE: I have been looking at these tables, and I think we are asking too high a standard price. As Mr. Haward said, you ought to go down two steps and compare two steps below. As that is so, and as we do not really want to increase it at all, or get anything more out of it, I think we should be wrong in asking 3s. 6d. and 3s. 5d. I think the standard price ought to be first for the 15-candle gas 3s. 5d., and for the 14-candle gas 3s. 4d.; and I am prepared to concede now that we really are asking by this more than we intended to ask.

The CHAIRMAN (to witness): What do you say as to this proposal of Mr. Balfour Browne. Do you think that is not low enough yet?

Witness: Perhaps I may be allowed to consider it.

It was then arranged that the Committee should adjourn, in order to allow consideration to be given to the proposal of the promoters.

On re-assembling,

Mr. BALFOUR BROWNE said: I am glad to say that, since the adjournment, Mr. Freeman and I have had a conversation; and, subject to the approval of the Committee, Mr. Freeman will be content with the following terms: The initial price to be reduced to 3s. 4d., instead of 3s. 5d., for 15-candle power gas, and to 3s. 3d., instead of 3s. 4d., for 14-candle power gas. I made a mistake when I was speaking before.

Mr. TREVELYAN: 16-candle power gas, what ——

Mr. BALFOUR BROWNE: Nothing, because we are not going to supply 16-candle gas. It does not come into the Bill at all.

Mr. TREVELYAN: Does that bring it down a penny?

Mr. BALFOUR BROWNE: Yes. The Bill, as you know, brings the gas down from 16 to 15 candle power. The result of this reduction will be to lower the authorized dividend at the present selling price of 2s. 8d. from £5 6s. to £5 4s.; for 15-candle power it will be £5 1s. 4d.; and for 14-candle power, £4 18s. 8d. This reduction is a reduction upon converted stock. Therefore you ought to multiply each of these reductions by 2½. That satisfies the London County Council. Then there is another matter they have asked us to do. I do it reluctantly; but if you approve, we will reduce the amount of capital in the Bill to £400,000. It will bring us back to Parliament earlier than would otherwise have been the case. I believe there will be £300,000 of 4 per cent. stock and £100,000 of debenture stock. Then they ask that clause 13—that is, the testing clause—should be struck out of the Bill. We agree to strike it out; but it is not to be made a precedent at all against me in opening the next Bill, because I have something to say about it in that Bill. I have agreed to strike it out, and the County Council are content, and will not oppose the Bill further.

Mr. FREEMAN: We have had an opportunity of discussing the matter; and I accept the statement that works will require a capital we did not know of, and therefore I am willing to add £100,000 to the capital I suggested.

The clauses were then adjusted, and the Bill ordered for report.

Death from Gas Poisoning.—An inquest was held at Plymouth yesterday week on the body of Arthur Henry Eastcott, 36 years of age, a journeyman brass moulder, who died from gas poisoning. It appeared that deceased, who lived with his father, went to bed about eleven o'clock on Friday, the 7th inst. On the following morning, when his mother went to call him, she found him lying in bed quite dead. The tap of the gas-bracket in the room was half on, deceased having apparently partly turned it on after extinguishing the light. The Jury found that death was due to gas poisoning.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold, by order of the Directors of the Bournemouth Gas and Water Company, a new issue of 1000 "B" shares (£10), carrying a dividend of 7 per cent., at an average of £16 5s. each, yielding the investor £4 6s. 2d. per cent. Another new issue placed by him was £10,000 of consolidated ordinary "C" stock of the Croydon Commercial Gas Company. The dividend on this class of stock since June 30, 1894, has been at the rate of 9 per cent. per annum, and since June 30, 1898, it has been paid free of income-tax, which, at the present rate of the tax, is equivalent to £9 10s. 6d. per cent. per annum. It was sold at an average of £193 12s. 4d. per £100 of stock, yielding the investor £4 12s. 11d. per cent.; but, in view of the above-named arrangement, the return is really close upon £5 per cent. Tenders for £7000 of 5 per cent. preference stock of the Gravesend and Milton Gas Company (which were recently asked for in our advertising columns), were opened last Tuesday, and were found to be far in excess of the amount required. The highest tender was £110 5s. for £100 of stock. Messrs. J. Carter Jonas and Sons recently offered for sale £2500 of consolidated "C" stock of the Cambridge Gas Company. Some £50 lots were sold at prices ranging from £57 to £58 10s. each; and a few £10 lots fetched from £11 to £11 10s. each. Ten £25 shares were sold for £285 10s.; and twenty £50 ones for £1149.

HOUSE OF COMMONS COMMITTEE.

Friday, March 14.

(*Before Mr.* EUGENE WASON, *Chairman, Lord* BALCARRES, *Mr.* C. P. TREVELYAN, *and Major* KENNETH BALFOUR.)

SOUTH METROPOLITAN GAS BILL.

This Bill—the object of which is to empower the Company to acquire additional lands for the manufacture of gas and for other purposes of their undertaking, to make provisions as to the testing of gas, and for other purposes—came before the above-named Committee to-day.

Mr. BALFOUR BROWNE, K.C., Lord ROBERT CECIL, K.C., and Mr. L. W. S. ROSTRON appeared for the promoters. The petitioners were as follows: Mr. Harris (represented by Mr. BOYLE, K.C., and Mr. THESIGER); the London School Board (Counsel reserved); The Blackheath and Greenwich Electric Lighting Company (Counsel reserved); the Corporation of the City of London (Counsel reserved); the Conservators of the River Thames (Mr. LEWIS COWARD, K.C.); the Greenwich Corporation (Mr. C. E. ALLAN); the St. Pancras Borough Council (Counsel reserved); the London County Council (Mr. FREEMAN, K.C., and Mr. TALBOT); and Redpath, Brown, and Co., Limited (the Hon. J. D. FITZGERALD, K.C., and Mr. MOON).

Mr. BALFOUR BROWNE, in opening the case for the Bill, said the Committee had heard a good deal about the South Metropolitan Company in the last Bill before them—the Commercial Gas Bill. The Company was one which had been formed by amalgamation of several Companies. Their original Act was passed in 1842; and the name of "South Metropolitan" was conferred under an Act of 1860. Since 1884, they had supplied the whole area south of the Thames, with the exception of two small patches which still belonged to the Gaslight and Coke Company. One of the recommendations of Sir James Rankin's Committee was that this portion of the Gaslight and Coke Company's area south of the Thames should be transferred to the South Metropolitan Company. Various negotiations had taken place with the view of carrying out the recommendations; but up to the present they had not succeeded. The Company had five manufacturing stations; and those in South London were much built around by houses. They had large works at Greenwich, on a bend of the river—on what was known as Greenwich Marshes; and one object of the Bill was to acquire land near these works for extension purposes. The Company had put themselves in line with the recommendations of Sir James Rankin's Committee, and had altered their sliding-scale; but upon this he would not dwell. They had had a clause in the Bill to enable them to purchase the portion of the Gaslight and Coke Company's district to which he had referred; but this had now gone. To deal more in detail with the objects of the Bill, they were, first, to obtain power for the compulsory purchase of the land, and to authorize the Company to construct additional gas-works on the portion so acquired; to authorize the Company to make a small road diversion (but this portion would be allowed to go); to vary the provisions regarding the testing of the gas by applying to the Company the provisions of the General Public Act—the Gas-Works Clauses Act of 1871—which applied to all gas companies except the three Metropolitan Companies; and to compensate the officers displaced by such change. It was also proposed to vary the provisions fixing the remuneration of the Directors; and to this part of the measure he did not think there was any opposition. As to the additional lands they proposed to acquire, the most important was the acquisition of land at Greenwich. The whole of the land they at present possessed would be used up in ten or twelve years. They were before the Committee, therefore, before there was any absolute necessity for land. But the land they contemplated acquiring could be obtained now at a very moderate price; but if they waited it might become more costly. In their desire to look ahead, so to speak, they were only imitating the example of Birmingham. That city had purchased a large amount of land, which was not immediately required by them, because it was vacant, and might be occupied by buildings if allowed to remain as it was, and therefore become more costly when it was necessary to secure it. The South Metropolitan Company also desired to take a piece of land which had been acquired from them by the London County Council when they were making their Blackwall Tunnel, but which had not been used.

The CHAIRMAN: What is the area of the land to be taken at Greenwich?

Mr. BALFOUR BROWNE: We have 40 acres at Greenwich; and we propose to make it 140 acres. The learned Counsel went on to say that he thought an arrangement would be arrived at with the County Council. The promoters were also seeking to acquire land at the Vauxhall works; their object being to improve the entrance, as the present one was exceedingly bad. Another section of the Bill would enable the Company to take leasehold land belonging to the Ecclesiastical Commissioners, but which the Commissioners could not sell without an Act of Parliament. This land was at Bankside, opposite St. Paul's Cathedral. Seeing that the undertaking of the Company had doubled in magnitude during the past twelve years, the Committee would see that it was not premature to add to the land they possessed. Their annual rate of increase was 6 per cent. compound. The other works of the Company were all in populous places, where there was no chance of increasing their size; so that all future increase must probably take place at East Greenwich. The future rate of increase, they thought, would be much greater than at present. As to the proposed amendment of the testing provisions of the Company's existing Acts, clause 14 was as follows:—

From and after the first day of September, 1902, the gas supplied by the Company shall be tested in accordance only with the provisions of the Gas-Works Clauses Act, 1871; and this Act and the provisions of that Act contained in the parts thereof headed respectively "Testing of Gas" and "Penalties," shall be incorporated with, and form part of, this Act; and in construing those provisions for the purposes of this Act, the prescribed testing-places shall be those at present in use—one for each station for manufacturing gas; and in case of any change in any such station, the substituted testing-place shall be on a leading gas-main not less than 18 inches in diameter, from which the supply of gas is taken, and at a distance not more

than 2 miles from a manufacturing station. The prescribed burner shall be the burner prescribed by the Act of 1900. Nothing in this Act shall be deemed to repeal or alter the statutory provisions regulating the illuminating power, price, or quality of the gas supplied by the Company.

Clause 15 read:

The Gas Examiner may test the gas supplied by the Company for sulphur other than sulphuretted hydrogen and for ammonia; and the following provisions shall have effect for the purpose of any such testing: The apparatus for testing shall be the same as that now used for the purpose at the testing-stations of the Company. The test for sulphur compounds may be made at any time; and the result of the testing shall be evidence of the amount of sulphur on the day on which the testing was commenced, and irrespective of its termination. The quantity of sulphur (other than sulphuretted hydrogen) permitted in the gas shall not exceed 22 grains in 100 cubic feet on an average of six days at any testing-station. The quantity of ammonia permitted in the gas shall not exceed 4 grains in 100 cubic feet in any one day. A day, for the purposes of this section, shall be calculated from 9 in the morning of one day to 9 in the morning of the next following day.

The effect of this would be to provide that the gas might be tested for sulphur and ammonia. It was included, because in the Gas-Works Clauses Act of 1871 there was no such provision; and the promoters thought it necessary, while they were adopting a general code, to supplement it by putting in this test. The effect of the provision would be to do away, so far as the Company were concerned, with the Gas Referees. These gentlemen were appointed under the powers of the Act called the Metropolis Gas Act, 1868. The Board of Trade were directed in that Act to appoint "three competent and impartial persons, one at least of them having practical knowledge and experience," as Referees. This Act was made applicable to the South Metropolitan Company by the Act of 1869; and all their gas was tested by these Referees. Under the Act of 1876, it was left to the Referees to issue instructions as to the manner of testing; and they had issued these regulations, which were exceedingly drastic and, the promoters thought, unnecessarily severe on the Companies. The result was great expense to the Company, which, of course, fell upon the consumers of gas. In the days when the legislation was passed, such gentlemen as these Referees might have been necessary, because the Gas Companies had a monopoly of the supply of artificial light. The only competitors with gas at that time were candles and oil; but the oil was from 5s. to 7s. a gallon, and, therefore, was hardly a competition at all. In the seventies, however, cheap mineral oil was introduced; and then commenced the fierce competition which had the effect of keeping down the price of gas so seriously. In the eighties, gas began to have another formidable competitor for artificial light—namely, electricity; and he asked the Committee to believe that the necessity for the Gas Referees no longer existed in the Metropolis. It was an anomalous and curious thing that there was one law for London and another for the rest of the country. The Gas-Works Clauses Act, 1871, was practically a General Act, applicable to all places in Great Britain; but this Special Act to which he had referred was enacted for London. The first Referees, no doubt, had come within the definition of the Act; and one of them was a gentleman possessing practical knowledge of the making of gas. But that was not the case now, the Referees being Professors of Chemistry; so that one part of the Act seemed to have been overlooked. The Act of 1871 had laid down a code as to the testing of gas; and the only thing omitted from it was the testing for sulphur. The results of the action of the Referees were exeedingly hard on the Companies. One test required was a 20 hours' test for sulphuretted hydrogen; and if there was one part of sulphuretted hydrogen in a million, it made the Company liable to be summoned and fined. The Committee would hear in evidence that one part of sulphuretted hydrogen in a million did not matter the least bit in the world. The getting rid of sulphuretted hydrogen, even in such small quantities, put great expense on the Company, and, therefore, on the consumers.

The CHAIRMAN: How are these gentlemen paid?

Mr. BALFOUR BROWNE said they were paid by the Board of Trade; but the Gas Companies found the money. The promoters contended that everything that was necessary was contained in the Gas-Works Clauses Act, 1871, and in clause 15 of the present Bill. He did not propose to deprive these gentlemen of their offices without compensation. Clause 16 said:

The Company shall compensate the Gas Referees and the Chief Gas Examiner for the loss of emoluments which may accrue to them respectively by reason of the provisions of this Act as to testing. The amount of such compensation shall be seven years' purchase of the sum paid by the Company towards the fees of the said several persons in respect of the year ending June 30, 1902.

There was another anomaly in connection with the Gas Referees. There was a gentleman who was a kind of Court of Appeal against the Referees; and he was called the Chief Gas Examiner. These questions, instead of going to the Magistrates to be dealt with, were settled by this gentleman. The Magistrates in every other place had to deal with these cases every day, and were competent to do so; but in London this anomaly existed.

The CHAIRMAN: Was he appointed under the same Act?

Mr. BALFOUR BROWNE: Yes.

Mr. FREEMAN: The Chief Gas Examiner is Lord Rayleigh.

Mr. BALFOUR BROWNE: Yes; an exceedingly eminent chemist and physicist, but, I take it, not a lawyer.

Mr. FREEMAN: You think he is not as good as a magistrate?

Mr. BALFOUR BROWNE said he was not as good as a Court of Appeal, however clever he might be in science. The Company did not want to escape from any obligation imposed on them in the interest of the public. What the result of the proposal in the Bill would be was this: With regard to sulphuretted hydrogen, the Referees' notification was that gas was to be entirely free from it in a 20 hours' test. The Gas-Works Clauses Act said that gas was to be wholly free during a 3 minutes' test. This made a great difference. The Act in the case of ammonia required a test for 4 grains in 100 cubic feet of gas; and the Referees required the test for 0·4 grain. For sulphur products, the Referees' test was 17 grains in 100 cubic feet in summer, and 22 grains in winter; and the Act would make it 22 grains on an average on a six days' test. In every one of these cases, he should call witnesses to show that the proposal of the Bill was reasonable and proper. As to the remuneration of the Directors, he believed that this was fixed in the year 1879, by a scheme carried out on amalgamation with the Phœnix Gas Company. If the output was 10,000 million cubic feet, the remuneration was to be £4000; if 9000 million cubic feet, £3700; if 8000 million cubic feet, £3400; and if 7000 million cubic feet, £3100. The proposal now was as follows:—

Section 17 (Remuneration to the Directors' of the scheme of 1880, is hereby repealed as from Dec. 31, 1902; and the sum payable by way of remuneration of the Directors of the Company shall not in respect of any one year exceed the sum of £5000 until the annual quantity of gas sold exceeds 12,500 million cubic feet, when the remuneration may be increased to not exceeding £5500; and when the annual quantity exceeds 15,000 million cubic feet, such remuneration may be increased to, but shall not exceed, £6000.

There was no opposition to this; the shareholders being willing that the Directors should have this remuneration. The learned Counsel then dealt with the petitions against the Bill. He referred first to the question of acquisition of land and the stopping up of footpaths; maintaining that the proposals of the promoters were reasonable. There were points dealt with in the London County Council's petition which ought not to have a place in a controversy of this kind. For instance, it was insisted that the Company should not post placards and notices on their buildings. The Company were not in the habit of doing this; still they did not wish to be bound not to do it. He protested against an attempt to obtain legislation which was altogether outside the scope of the Bill. He took exception in the same way to a clause in the petition which said that the Company should not be allowed when pulling down buildings to leave the works in an unsightly condition.

Mr. FREEMAN remarked that these were all standard provisions.

Mr. BALFOUR BROWNE said that, with regard to that part of the petition dealing with the question of gas testing, there was no intention to take away the powers of the Gas Examiners to test the gas. They wanted to get rid of the Referees, not of the Examiners. Clause 24 of the petition said:

A special and complete system of gas testing has been applied to the Company, similar to that which applies to the two other large Companies supplying gas in the County of London—viz., the Gaslight and Coke Company and the Commercial Gas Company. The areas of supply of the said Companies include nearly the whole of the said county. Under these statutes, certain Gas Referees appointed by the Board of Trade certify certain testing-places and apparatus and materials; and Gas Examiners appointed, controlled, and paid by your petitioners, are required to make, and do make, daily at each of such testing-places, in the mode from time to time prescribed and certified by the Gas Referees, such a number of tests as the Gas Referees may prescribe of the illuminating power, purity, and pressure of the gas supplied by the Company, and there is an appeal for the Company against any test made by such Examiners to the Chief Gas Examiner—an official appointed by the Board of Trade.

By the South Metropolitan Gas Act, 1900, provision was made for the decrease of the illuminating power of the gas supplied by the Company from 16-candle power, which it had been thitherto (and which is the power at which the said other two Companies are bound by law to supply gas within the said County of London) to 15-candle power, and then to 14-candle power, with a reduction in the standard price. By section 6 of the said Act, provision was made that in the testing of the gas supplied by the Company at either the 15 or 14 candle illuminating power authorized by such Act, the burner for testing should be so used as that the gas should be burnt at such a rate as to give a light equal to 16 candles. Your petitioners humbly submit that such a provision has since been found in practice unsatisfactory, and should be amended accordingly.

It would be recognized at once that this had reference to what was clause 13 in the last Bill, which was struck out by agreement. It was struck out because the Commercial Company secured other conditions which they were anxious for from the County Council. The South Metropolitan Company were not asking for like conditions. What was dealt with was a power given them in 1900; and they were only asking that it should be preserved. The Commercial Company had said: "Put us in the same position as the South Metropolitan Company." His Company were asking that this power should not be taken away. The petitioners said:

The provisions of the Gas-Works Clauses Act, 1871, as to testing have never been applied to the said three large Companies supplying gas within the County of London, nor was it ever intended that they should be so applied. The provisions of the Company's Act of 1876 which repealed the then existing testing provisions of their Act of 1869, instead of incorporating the provisions of the said Act of 1871, provided special and more stringent provisions in this matter; and similar special provisions were applied to the said two other large Companies supplying gas within the county—viz., to the Commercial Gas Company by their Act of 1875 and to the Gaslight and Coke Company by their Act of 1876. These special provisions were amended and confirmed by the Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880, which applied to all the said three Companies.

The proposal of the Bill would, if it became law, have the effect of applying to the Company testing provisions which Parliament has hitherto thought to be insufficient, and would remove entirely the control of the Board of Trade and of your petitioners in such matter. Your petitioners submit that the application to the Company of testing provisions less stringent than now existing are, in view of the recent reduction of the illuminating power of the Company's gas, particularly undesirable.

Parliament had thought the testing provisions insufficient in the early days; but it had not taken that view of recent years. As to the last paragraph, the Committee, of course, would have to be convinced that the promoters were not going to do any harm to the consumers. Then the petitioners said:

Your petitioners humbly submit that, even if any variation of the present mode of testing is desirable, it should be made applicable at the same time by a general measure to the Commercial Gas Company and the Gaslight and Coke Company, which are subject to statutory restrictions similar to those at present regulating the Company, and that the Bill accordingly seeks to disturb the existing uniformity in the greater part of the County of London as regards the testing of gas.

He was sorry the Gaslight and Coke Company were not before Parliament this year. As for the Commercial Gas Company, they had never thought of the proposal, or they no doubt would have made it. But because they had not made it, was no reason why the South Metropolitan Company should not be put under the general law; and it was not for them to propose general legislation. It was for the County Council to do this; but probably they did not desire to move in this particular direction. Another petition was that of G. & A. Harris,

who were the owners of some 114 houses in Glenthorpe Street and in Glenthorpe Road, producing £4800o per annum. They feared that the erection of gas-works close to their property would create a nuisance and prejudicially affect them. Counsel believed no damage would be done by the erection of the works; but he would leave that to the witnesses to deal with.

Mr. *George Livesey*, examined by Mr. ROSTRON.

Witness said that the objects of the Bill were to authorize the acquisition of land, to free the Company from the vexatious and irritating restrictions of testing, and to allow the Directors' fees to be increased. It was proposed to acquire land at Vauxhall, Bankside, and East Greenwich. At Vauxhall, three or four cottages were required, in order to give better access to the works from Upper Kennington Lane. At Bankside, part of the works of the Company were on land held on leases which would expire in three or four years' time; and power was therefore sought to purchase the freehold. During the last ten years, the Company had improved and extended their plant at all their old works, which were now operating at their full capacity. The East Greenwich works, for which the Company obtained power to purchase land in 1881, were laid out for the erection of twelve retort-houses. Four were at full work; so that there were eight yet to be brought into operation. These eight would make about 50 million cubic feet of gas daily; and so by the time the land at East Greenwich was occupied, they would be able to double their product. If the present normal rate of increase were maintained, the limit of capacity at East Greenwich would be reached in eleven or twelve years. But he thought it would be maintained at a smaller rate. At 4 per cent., the consumption would be doubled in seventeen years. Fifty per cent. of the output of the Company was used for purposes other than lighting; and one of the great pressing necessities of towns, and in none more than London, was a cheap gaseous fuel. The gas at present supplied was too expensive (owing to the illuminating power which it must possess) to be used as fuel; but the necessity for illuminating power in gas was coming to an end. In Germany, he was informed that from 85 to 90 per cent. of the whole of the gas used for lighting purposes was consumed by means of incandescent mantles; and, that being so, luminious gas was not wanted. He was happy to say that in England they were very near to obtaining a cheap mantle. He had been in negotiation with the people who supplied mantles; and he thought they would very soon come to an arrangement, which would be satisfactory. A very friendly spirit was being shown; and he had almost come to an agreement whereby cheap mantles would be obtainable. Gas companies, if they had regard to their own interests, would undertake to supply these mantles.

Mr. ROSTRON: If you do that, do you see any reason why incandescent lighting should not be employed as much in England as in Germany?

Witness: No. Two or three months ago, my Company commenced to offer, for a small charge, to attend to consumers' burners; and we have now twenty men doing nothing else. This might be extended almost indefinitely when we have a cheaper mantle.

Do you happen to know what the illuminating power of gas in Germany is?—I am told it is 8 or 9 candles.

By the CHAIRMAN: The retail price of a mantle was about 7½d. But there was also the expense of a burner; and the Welsbach people, under the old arrangement, insisted on the consumer using their burner with their mantle. The new management, however, had told him that all these restrictions had gone. The mantle would be reduced to below 3d., and the burner to 1s. If 90 per cent. of the Company's consumers burnt gas by means of the Welsbach mantle, he thought the Company would be justified in coming to Parliament and urging that they should not be compelled to supply gas of high illuminating power, and that the remaining 10 per cent. must be content with gas of low illuminating power, or else use some other light. When cheap gas was supplied, he believed there would be an enormous demand for it for fuel purposes. If this should happen, the increase of consumption might be at any rate, and the limit of the East Greenwich works very speedily reached. Gaseous fuel would do away with the smoke nuisance. The land at Greenwich proposed to be acquired for gas manufacturing purposes was the only site within reasonable reach in London. If they did not take the present opportunity of acquiring the land, before it was built upon, he saw no other course than to go down to Erith or Plumstead, which would certainly not be either convenient or economical places. The further the works were from the district of supply, the more troublesome and expensive it was to convey the gas to the consumers; and it would be very difficult to pass through Woolwich, which was much occupied by main-drainage works. The interest on the money necessary to buy the land would not be a heavy burden. The cost of the land, judging from what they had paid for land in the vicinity—viz., £500 to £750 an acre—would not amount to more than a tenth of penny per 1000 cubic feet of gas sold. The Company thought it advisable, having regard to their probable future needs, to acquire the land. If London wanted fuel gas, the Company ought to be in a position to supply it. It would never do for another company to come in and duplicate mains all over the district, if the South Metropolitan Company could prevent it.

Mr. ROSTRON: What is your view generally as to the working of the existing regulations with regard to gas-testing?

Witness: My view is that they are an intolerable worry to everybody connected with the management of gas-works. They are so stringent that our Managers never know whether they are right until the test reports come in the next day. The Company test for themselves; but the tests made by the authorities might not agree with theirs, and so the Company might be liable to a penalty.

In further examination, witness said when he entered his office in the morning and saw the test-papers, he would not examine them, because he remembered what used to happen in connection with them. In one case, there was one-third of a grain of sulphur too much in the gas; and the result was that they had to go before the Magistrates, and it was published in all the newspapers that they were selling impure gas. They could not make 16-candle gas from ordinary coal; that was their main reason for asking for an alteration in the candle power. Now they were allowed, as from July 1, 1901, to drop to 15 candles, and to 14 candles four years later; the interval being permitted for the necessary alterations in the plant to be effected, But they thought it better to drop to 14 candles at once. They had given the consumers the advantage of the change at once; but the Company had not made any saving, though the Engineers had been freed from the constant anxiety and worry they used to experience. The gas supplied by the South Metropolitan Company now was about 15-candle power. The duties of a gas manufacturer were very onerous; and it was really wonderful that London was furnished with gas with the extreme constancy and regularity of the present supply. The Companies did not mind the work; but they did not want the added worry of the testing, which did not do good to anybody. The consumers had not benefited by this stringent system. Thus the consumer was not affected by the extra ½ grain of sulphur in the gas, and he would not be affected if the quantity were 10 grains. Prior to 1860, there was no official testing at all except in the case of the City, under the Great Central Company, which was started in 1850. All over the kingdom, before that date, there was general competition among gas companies; and if the consumer was not satisfied with one company's gas, he could change to another. In 1853 south of the Thames, and 1858 north of it, the competing companies divided their districts—thus depriving the consumers of the benefit of competition. In 1860, the districting of London was legalized, and the first provisions for testing instituted. The Act of 1868 gave authority to the Board of Trade to appoint three competent and impartial gentlemen to act as Referees, one at least of whom should have practical knowledge and experience in the manufacture and supply of gas. Three gentlemen were appointed; one being Mr. Frederick J. Evans, whose position was rather anomalous, seeing that he was Engineer to the Gaslight and Coke Company, and therefore had to prescribe for his own Company. They dealt with the question of testing the illuminating power and other matters, but not with sulphur compounds. They could not prescribe the limit of sulphur allowable in gas, because the employment of lime to remove sulphur created a nuisance. It was the use of lime that had given gas works a reputation for evil smells. In 1850, however, oxide of iron was introduced for purifying purposes, to take the place of lime in removing sulphur; but it would not touch sulphur compounds. Of the present Gas Referees, one was a chemist, one a very able physicist, and one an eminent physiologist; but not one complied with the requirement of practical knowledge and experience in the manufacture and supply of gas. He did not find fault with the Referees; but he contended that the Board of Trade had failed in their duty, and he had told the Board so more than once. He had come to the conclusion that the Board of Trade could not find a man who complied with the conditions, which required that a Referee should not have connection with any gas company, and should not pursue any professional work in connection with a gas company; and therefore the companies had been under men whose orders, he held, were *ultra vires*. The prescribing of the methods of testing for illuminating power, for sulphur in any form, for ammonia, and for pressure rested with the Referees, and formed, in short, their duties; and their power did not extend beyond London. The actual testing of the gas was done by Examiners appointed by the London County Council; and their report was conclusive as to the results of a test, subject to appeal to the Chief Gas Examiner. Under the Act, the Company had the right to have an officer present when a test was made, to see that it was properly performed; but the Company very rarely exercised this right. They were not allowed to interfere with the test in any way. The Chief Gas Examiner was appointed by the Board of Trade; and his report on appeal was conclusive evidence. He was appointed because it was said that this was a highly technical matter. If the fault was due to any unavoidable cause, the Companies should not be liable to a penalty; and it was felt that an ordinary Magistrate would not be able to go into these matters, and therefore that it would be better to appoint a specially qualified man.

As the Committee were about to rise,

Mr. DU CANE said he had to make the same offer on behalf of the Board of Trade as in the case of the Commercial Bill. If the Committee wished for any information, the Board would be glad to give it.

The CHAIRMAN: I must give you the same answer as I gave this morning.

Monday, March 17.

Mr. Livesey was this morning further examined by Mr. Rostron; his evidence again being chiefly directed to the question of testing. He also dealt with the instructions of the Metropolitan Gas Referees as to the service-pipes to the testing-places. He said the meaning of these instructions was: "We don't believe you, and we don't trust you." The witness was cross-examined by the Hon. J. D. Fitzgerald, for Messrs. Redpath, Brown, and Co. He stated that the jetty at East Greenwich was only large enough for the present retort-house; and he denied that there was room for another jetty on their existing river frontage. It was advisable that while they were going for land, they should take a sufficient area. By their proposals the acreage would be brought up to about 160; and they had to prepare for what he believed would be an enormous demand for gas in the future. In cross-examination by other Counsel, witness stated that he had never appealed against the prescriptions of the Referees, simply because he did not think any good would result. The Board of Trade, however, were well acquainted with his views. Taken back to the proposed new site at East Greenwich, he said it was too early yet to make plans as to what it was proposed to do there—the future would have to decide the character of the works. (To the opponents on minor points affecting the land, some concession was made by Mr. Livesey.) Replying to Counsel for Messrs. Harris (the owners of neighbouring property), witness said he thought he might promise that purifying plant would not be placed nearer than 300 yards of Tunnel Avenue. Questioned by the Committee, he said he did not think an industrial concern should be subject to the whims and fancies of scientific gentlemen such as the Gas Referees. Mr. Charles Carpenter then gave evidence as to the present manufacturing operations of the Company. Dealing with the land at East Greenwich, he said he thought the Company should have a larger amount of river frontage than they had at present. Our usual full report of the portion of the proceedings here summarized will be given next week.

HOUSE OF COMMONS COMMITTEE.

Friday, March 7.

(*Before Sir* SAVILE B. CROSSLEY, *Bart., Chairman, Mr.* STEVENSON, *Captain* JESSEL, *Mr.* SOARES, *and Mr.* BONHAM CARTER, *Referee.*)

READING GAS BILL.

Mr. CLAUDE BAGGALLAY, K.C., and Mr. ERNEST MOON appeared for the promoters; and Mr. PEMBROKE STEPHENS, K.C., represented the petitioners, the Corporation of Reading.

Mr. BAGGALLAY, in opening the case on behalf of the promoters, said Reading was supplied with gas from 1836 until 1862 by two Companies. In 1862, the present Company was incorporated; being an amalgamation of the original two Companies. The limits of supply were the borough of Reading, and also Sonning, Early Whitley, Southcot, and Tilehurst (Berks), and Caversham and Sonning (Oxford). The population of Reading at that time was about 25,000. The Act of 1862 was the outcome of a somewhat severe fight between the Company and the Corporation; and the result was that certain somewhat stringent provisions were inserted in the Act, some of which it was proposed by the present Bill to modify. The capital then authorized was £20,000 of share capital entitled to a maximum dividend of 8 per cent., £5000 entitled to a maximum dividend of 5 per cent. (those two sums being allotted to the shareholders in the old Companies), and £15,000 of new capital, which was entitled to a maximum dividend of 7 per cent. By the Bill, the Company were only entitled to pay back-dividends for a period of two years. Another stringent provision, directly contrary to the interests of the consumer, was that the new share capital should be sold by auction locally in Reading, the immediate result of which was to limit the market. The Act of 1862 also authorized the Company to raise £10,000 by way of loan—that being equivalent to one-fourth of the share capital. While the £15,000 of new share capital was to be raised by auction, the premiums were not to be taken into consideration in ascertaining the amount which might be raised, but were to be brought in as additional capital. There were certain other onerous obligations. In carrying the gas-pipes to the consumers, the Company had to pay double the amount which they would have had to pay under the Gas-Works Clauses Act; and the consumers only had to pay half the amount, on account of the Company having to carry the pipes much nearer to their premises. They had also to supply meters free of cost, unless the consumer could only take as little as 2000 cubic feet of gas in the half year. In 1870, a supplementary Act was obtained by the Company, by which the limits of supply were extended to Shinfield (Berks) and Mapledurham (Oxford), and further capital of £40,000 was sanctioned. In 1880, a third Act was passed, which authorized an additional amount of capital of £80,000; and the loan capital was fixed at £20,000. The prices were graduated in two ways. First of all, the scale differed between Reading and the district outside, and it also differed according to the quantity consumed. The actual charge made outside the borough in 1896 was 2s. 10d. per 1000 cubic feet, and remained so till the beginning of 1900. Outside the borough during the same period, the charge was uniformly 3s. 4d. In 1900, on account of the coal famine, the price was raised, 2d. only. No meter-rental was charged—meters were fixed and maintained free of cost; and the necessary service-pipes were provided and laid into the consumers' premises and maintained free of cost, provided the distance within the premises did not exceed 50 feet. Gas cooking-stoves and fires let on hire were fixed free of cost. There was also free inspection, maintenance, and repair of gas stoves and fires. These were very substantial advantages to the consumers. The whole of the capital had been called up. The opposition of the Reading Corporation was principally with regard to the amount of additional capital proposed to be raised; the other points were of minor importance. The total capital raised by shares and loan from the commencement of the Company up to the present time was £204,242 2s. 6d. The amount of additional capital proposed was £180,000, including premiums; and it was proposed to fix a 5 per cent. maximum, and, in addition, £60,000 of borrowing powers. In respect of the capital already existing, it was proposed to raise the amount the Company might borrow to the equivalent of one-third of the capital as converted. This meant an addition of £29,958; making the actual new capital, in round figures, £270,000. Taking the last five years, there was an increasing sale of gas by the Company of 4·22 per cent. per annum, compound rate of increase. In the last ten years, the increase was 3·55 per cent. compound rate per annum. Evidence would be given to show that the Company would be justified in estimating for the future on a 5 per cent. compound rate of increase in consumption, and that the capital asked for was not large. It would keep the Company away from Parliament about fourteen or fifteen years, which was the proper length of time for a Provincial Company. Counsel then proceeded to deal with the figures to show that the capital asked was not excessive. Continuing, he said that by one of the clauses of the petition the Reading Corporation stated that the auction clauses in the Bill were not in the form usually sanctioned by Parliament, and objected to the power sought to enable the Company to create a preference in favour of holders of stock in, and employees and gas consumers of, the Company in the case of tenders for the additional capital proposed to be authorized. He could not see why the objection was made.

Mr. PEMBROKE STEPHENS said that the Corporation only stated it was not in the usual form; but they were willing to hear the reasons in favour of the proposal.

Monday, March 10.

Mr. *A. H. Cane*, the Secretary of the Company, in cross-examination, stated that the effect of the stock conversion would be to increase the nominal capital by £53,532; and in altering the proportion of the borrowing powers, and making this applicable to the old capital, they would obtain an increase of loan capital of nearly £30,000. Adding this to the new share and loan capital would give the Company £270,000 of additional capital under the Bill.

Mr. PEMBROKE STEPHENS: Looking to the amount of capital that has served the Company for over forty years, this proposed new capital is abnormal?

Witness: No; the sum asked for is necessary to meet the requirements of the Company.

Mr. *John Egginton* gave evidence as to the growth of the population in the outside districts.

Mr. *Corbet Woodall*, in examination by Mr. BAGGALLAY, said he considered it was in the interests of the consumers, as well as the shareholders, that the conversion of capital, as proposed by the promoters, should be permitted. Since the sale of shares by auction, the nominal rate of dividend was misleading. To call capital which had been sold by auction and yielded a little over 5 per cent. to the holder, 7 per cent. capital, was utterly misleading to the general public. The total charge for dividend was only about 5¼ per cent., averaged over the dividend-bearing capital; and if the borrowed money were included, it brought it down lower still—the average being remarkably low. He had carefully considered the amount of capital which the Company should ask for.

Mr. BAGGALLAY: Do you find, by investigation of the statistics relating to the Company, that there is a steady growth of increase of consumption and make?

Witness: Yes. I have taken the future increase at 5 per cent., which is higher than the past average, because the Company propose starting a new business in supplying the poorer population by means of prepayment meters. That will bring in a new class of consumer.

In fixing the amount of capital, you have taken into consideration the fact that the present authorized capital is practically exhausted?—Yes; and also that they have no working capital except money obtained by way of overdraft, and the balance of undivided profits (amounting to about £15,000) which they have used.

In further examination, witness said, taking the rate of increase at 5 per cent. compound per annum, the output of gas would be doubled in fourteen years; and therefore the capital required would be about double that expended at the present time. This was a very reasonable way of taking it. The Company had spent its capital remarkably well. The proportion of capital was £530 per million cubic feet of gas sold, which was distinctly below the average of gas companies of the same character.

Mr. BAGGALLAY: Do you find that works are constructed at the present day at the same rate?

Witness: No. Works are built to manufacture gas more economically; but the expenditure of capital is considerably heavier than it was fifteen, or even ten, years ago.

As regards distribution, you have to bear the increased cost whether you like it or not. It is due to wood pavement, or concrete, making the labour of laying new mains more expensive?—That is so. I have no hesitation in saying that the estimate of £270,000 of new capital is an exceedingly moderate one.

After a brief cross-examination by Mr. PEMBROKE STEPHENS, witness was re-examined upon the points introduced. He said that the present producing power was enough with an expenditure of about £2500 to carry them over to next winter. The gasholder capacity, even with the recent additions, was only sufficient for about 300,000 cubic feet above the twenty-four hours' maximum make. That would only be adequate for a very few years.

Mr. BAGGALLAY: I gathered from my learned friend's cross-examination that he will put it to the Committee that you have certain plant which will render unnecessary some of the capital you are asking for, Taking your works all round, is it a fair and proper way to provide for the future to see what your cost of production has been in the past, and then to see what you will require to double that capacity in the future?

Witness: Yes; granted the expenditure in the past has been at a low rate, and this is a very remarkably low rate.

You must look fourteen or fifteen years ahead to see what you will require?—Yes.

The CHAIRMAN: The capital expended in works is greater now than formerly?

Witness: Yes.

Is there a corresponding increase in labour and current expenses?—Yes.

This closed the case on behalf of the promoters.

Mr. *W. A. M'Intosh Valon*, examined by Mr. PEMBROKE STEPHENS, said that, in his opinion, the amount of capital asked for was excessive. In regard to the proposed addition in respect of the prepayment meters, a company got a higher price for gas by them; and the practice was for the difference between the two prices to be divided—one-half of the surplus being put to a suspense account, which in five years paid off the extra cost of the slot meters, while the increase of price, of course, continued.

Mr. PEMBROKE STEPHENS: Do you see anything in the past history of the Company, or in the present circumstances of Reading, to justify a capital of £270,000?

Witness: No.

In cross-examination by Mr. BAGGALLAY, witness admitted that the penny-in-the-slot meters would cause an increased consumption, but not to the extent suggested.

At this stage, there was a brief consultation between the Counsel on both sides, after which

Mr. BAGGALLAY said the parties had agreed that the additional capital raised should be £150,000 instead of £180,000, with £50,000 borrowing powers. It was also agreed that the Company should be permitted to borrow to the extent of one-fourth of the nominal amount of the share capital when converted, less £32,500 which had already been raised, and that the reserve fund should be limited to £27,000.

The consideration of clauses was adjourned.

Tuesday, March 11.

The Committee to-day devoted a short time to the consideration of clauses. Certain new clauses were brought up, to carry out the agreement which had been arrived at; and these were approved by the Committee. They provided that the maximum price should be 3s. 9d. within the borough, but made no change respecting the price in the

outside districts. No change was made in the candle power, which remains at 14. A new clause (which had received the approval of the Earl of Morley, the Chairman of Committees in the House of Lords) was inserted on the subject of the reserve price of stock. It provided that when the 5 per cent. stock to which the 7 per cent. shares have been converted are offered for sale by auction or tender, the Company should have power to fix the reserve price below par.

The remaining clauses having been disposed of, the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

COURT OF SESSION.—FIRST DIVISION.

March 11 and 12.

(*Before the* LORD PRESIDENT *and a* JURY.)

The Fatal Gas Explosion at Dundee.

The Lord President (Lord Blair Balfour) and a Jury had before them three actions brought against Messrs. Smith Bros., clothiers, "The Globe," Murraygate, Dundee, in which damages were sought for injuries sustained in an explosion of gas in the girls' workshop in defenders' establishment on the afternoon of Dec. 20, 1900. Susan Cameron, a skirtmaker, sued for £1000; her father, John Cameron, a traveller, sued for £500 in respect of the death of his son Richard; and Nellie Sloggie, a tailoress, sued for £500. The facts relating to the actions have already been recorded.*

Mr. WATT, K.C., and Mr. A. DUNCAN SMITH represented the pursuers; and Mr. SALVESEN, K.C., and Mr. HUNTER appeared for the defenders.

After evidence had been given, lasting part of two days,

The LORD PRESIDENT, in addressing the Jury, said the question was whether the explosion occurred through the personal fault of the defenders. He pointed out that the origin of the accident was certain damage to a gas-bracket by "larking" among the girls, and went on to say that the direct and immediate cause of it was that one of the two men killed, with an unwisdom which they would say was almost incredible folly, if they had not known that such things had happened before, most unfortunately plunged his naked light into the receptacle between the two floors, where the gas had accumulated. This did not seem to bring the defenders into contact with it. They were not there, and they did not send the man to do the work, still less to put a naked light into a receptacle filled with gas. The place was comparatively new; and there was, therefore, no case of a structurally bad building, or that the gas-fittings did not satisfy the high standard which was exacted in Dundee and other towns. He thought the proposition which Counsel laid down came to this—that the fault of the defenders was in permitting an escape of gas to go on for an unduly long time, especially after complaints had been made by the girls. They would, no doubt, keep in view that the larking among the girls and the breaking of the pipe was deliberately kept from the knowledge of the masters. They would judge whether there was anything the partners had heard of which at all suggested to the individual partners that there was a dangerous escape of gas, or an escape of gas which was likely to lead to an explosion. They could all be wise after the event; but the Jury must consider whether, in the state of the knowledge of the defenders at the time, they could have done anything more than they did in sending for a plumber—the sad part of the business being that, in the meantime, one of the deceased went and plunged his naked light into the place.

The Jury, after an absence of an hour, returned a unanimous verdict for the defenders.

Dispute Between Wharf Owners.

Mr. Justice Swinfen Eady has lately settled, in the King's Bench Division of the High Court of Justice, a dispute which had arisen between the Land Securities Company, Limited, and the Commercial Gas Company in regard to the user of their wharf frontage on the Thames, at Wapping. The first-named Company claimed an injunction to restrain the defendants from so berthing steamships as to overlap any part of their foreshore. They took up the position at the trial that, for purposes of loading and unloading, the parties were strictly limited to the right of using that part of the river which was opposite their own premises. On the other hand, it was contended for the defendants that the Thames was a navigable highway open to all the public, and that the first comers had the right to have their vessel berthed at the jetty, and keep it there the whole time it was reasonably necessary to discharge or load, even though in doing so it overlapped the adjoining premises, and obstructed access thereto. His Lordship came to the conclusion that each party had berthed vessels so as to interfere with the access of those belonging to the other side, though neither had wantonly kept the vessels at the berths longer than was reasonably necessary for the purpose of discharge. In a case similar in many respects to the present, relating to the Thames, Sir George Jessel had to consider the law on this matter. His Lordship read from the judgment delivered in that case, which he adopted. He said he was of opinion that a wharfinger was entitled to berth his vessel alongside his jetty, even though it overlapped the neighbouring frontage, and to keep it there, for the purpose of loading or discharge, so long as he did not interfere with access to his neighbour's wharf; but that when access was required by the neighbour, the vessel must be moved to give that access at once. In so holding, he considered he was following both the spirit and letter of the law laid down by Sir George Jessel. He had to make an order in such form as would protect the legal rights, and at the same time not unnecessarily restrict the use of the premises. The order would provide for an undertaking by the plaintiffs not to allow any steamship to lie at their wharf, so as to obstruct the defendants' access when they wished to have a vessel approach, lie at, or leave their jetty, and an injunction in similar terms against defendants. The case was, however, not one in which he ought to make any order as to costs.

* See "JOURNAL," Vol. LXXVII., pp. 37, 419; and Vol. LXXVIII., p. 1397.

Winding Up of the Kern Burner Company, Limited.

On Thursday, the 6th inst., a creditor's petition presented by Messrs. J. Harper and Co., Limited, for the winding up of the above-named Company was in the list for hearing before Mr. Justice Byrne; but it was ordered to stand over for a week, as negotiations were proceeding which it was hoped would result in all the creditors being paid. Last Thursday, the Court was asked to dismiss the petition—all parties concurring in the application. His Lordship said he would allow the petition to stand over for a week, so as to see whether anyone wished to be substituted for the petitioner, and to take up the proceedings.

Thefts from Prepayment Meters.

At the Salford Police-court, last Tuesday, a lad named Isaac Michae was charged with breaking and entering an unoccupied house—No. 26, Whalley-street, Broughton—with intent to commit a felony, and also with a similar offence at No. 1, Springfield-terrace. In the latter case he was charged with stealing 2s. 4d. from an automatic gas-meter. On each occasion, Michael called on the agent of the house, and went over it with him, and, on finding that there was an automatic gas-meter, fixed departed. He returned later in the day, and effected an entrance from the back of the house. He was seen by the neighbours, and on the second occasion was caught when attempting to leave the premises. Prisoner was sentenced to four months' hard labour.

Compensation to a Gas Stoker.

At the Stoke County Court, a few days ago, before his Honour Judge Mulholland, K.C., George Herbert Barber sued the Stoke Corporation for £1 per week compensation for an accident alleged to have been met with while he was in their employ as a gas stoker. Mr. Moody, on behalf of the applicant, stated that while he was working on the bridge-pipes he slipped, and fell a distance of 18 feet, the result being serious injuries to the spine, for which he was under treatment for eight or nine weeks in the Infirmary. It was thought he was permanently incapacitated for work. Correspondence was read to show that the Corporation agreed to allow the man £1 per week, and several payments had been made; but since the 17th of October last, nothing had been received. The case turned upon the point whether or not Barber was in the service of the Corporation when he met with the accident, which happened on Saturday, Feb. 23, 1901. He denied that he was not, and said he never heard anything about discharge till nine months after the occurrence. His Honour pointed out that the Town Clerk, in the course of a letter, expressed the hope that the applicant would be able to return to his work soon; and yet the defence now set up was that the man was dismissed on the Saturday morning. It was perfectly shocking. Mr. Elliott, for the Corporation, said the letter was an unfortunate one, and was written under a misapprehension as to the facts. His Honour said the question was, was not the defence unfortunate—saying the applicant was dismissed in disgrace after having paid him more than £30. Frederick Horton, the foreman, stated that on the morning of the accident he told Barber that Mr. Prince, the Manager, had instructed him to stop work, in consequence of the pipes having become choked through neglect. Barber replied that his agreement was with Mr. Prince, and went about his work as usual. In reply to His Honour, witness said he considered this attitude was quite reasonable; and permitted Barber to stay on the premises. Mr. Prince was called, and stated that he told Horton to discharge Barber. He said Horton had power to send away the workmen under him at will; and he had put it into practice in the case of some of the men. His Honour asked witness if he considered it fair to discharge a man without calling attention to his fault, and allowing him an opportunity of being heard in his own defence. Witness replied that he did, under certain conditions. In cross-examination, he admitted that in the return submitted to the Insurance Company the applicant was stated to have been in the employ of the Corporation at the time the accident occurred. His Honour said the case puzzled him for a long time; but he had now got to the bottom of it with the assistance of Mr. Prince, who had given his evidence in a straightforward way. His Honour found that Barber was not discharged; and as there was no doubt he was at present totally incapacitated, he made an order that he should be paid £1 per week during such incapacity, with costs.

The Costs in Connection with the Burgess Hill Water Bill.—At the last meeting of the Burgess Hill District Council, the General Purposes Committee having considered the opinion of Mr. Macmorran, K.C., upon the subject, recommended that the Council should apply to the Local Government Board for sanction to borrow a sum of £1100 for ten years, to defray the Burgess Hill Water Company's costs, as taxed, against the Council in connection with the parliamentary proceedings relating to the Burgess Hill Water Bill, 1901, and the taxed costs of the opposition by the Council to the Bill in the House of Commons.

Leicester Water Supply.—The Water Committee of the Leicester Corporation reported, at the meeting of the Town Council last Tuesday, that the profit realized in the year ending Dec. 31, after paying interest on the capital of the undertaking, is £9810 5s. 4d. Out of this has been paid the sum of £3276 14s., the half-year's amount on the sinking fund, leaving a balance of £6533 11s. 4d., which amount the Committee recommended the Council to carry to the credit of the special water fund, created under section 164 of the Derwent Valley Water Act, 1899, together with the balance for the half year ended the 30th of June last. The quantity of water delivered during the past year within the limits of supply was 1,858,226,100 gallons; and the average consumption per day per head of the population supplied was 19·41 gallons, including the quantity used for trade purposes. The number of houses on the books at the end of December was 53,591; giving an estimated population of 248,662 persons. The report was adopted.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Ninety-fourth Ordinary General Meeting of this Company was held on Monday, the 10th inst., under the presidency of Sir FREDERICK T. MAPPIN, Bart., M.P.

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts for the half year to Dec. 31, which were noticed in the "JOURNAL" for the 18th ult. (p. 428). He said they must be regarded as satisfactory; the working of the concern during the six months having been, on the whole, fortunate. The reduction of the price of gas made by the Board in October last had been justified, for, after providing for the dividend, a balance of £3467 remained, which, added to the previous half-year's balance, made a total of £17,709 to carry forward to the current account. The reserve fund remained at its maximum (£86,848). He thought the shareholders would agree that the Directors acted wisely in reducing the price 2d. per 1000 cubic feet. The receipts for gas were only £3953 less than in the corresponding half of 1900. They had also received £15,634 less for coke, and £1479 less for tar; while the cost of mains and services, repairing and renewing, had been £3826 more, and rates and taxes £1598 more. On the other hand, coals had cost £28,966 less, and they had received for sulphate of ammonia £716 more. As to the quality of the gas, 1002 tests had been made during the six months, and the illuminating power had averaged 17·40 candles; while for the twelve months, 2119 tests had shown an average of 17·34 candles—both figures being beyond the standard required by law. The consumption of coal—144,817 tons—was 4688 tons more than in the corresponding half year; and the production of gas had increased by 36 million cubic feet, to 1421 millions. The leakage—72,570,000 cubic feet—was considerably more (against 55,419,000), and was due, probably, to a somewhat higher pressure of the gas in connection with the naphthalene difficulty. The make per ton had been 10,319 cubic feet, against 10,282 cubic feet. The total number of meters fixed was now 67,950. There had been a most satisfactory increase of 3173 during the twelve months—showing that the property of the Company had not gone backwards in any way. Most of the additional meters were 3-light; but they varied upwards to 400-light. There had been a large increase of gas-fires; 1520 having been sold and fixed during the twelve months. Of boiling and other stoves, the number was 955; and 311 additional cooking-stoves had been let out on hire. There had been fixed 93 additional gas-engines—a most gratifying feature, of which he would have something further to say before sitting down. Of Welsbach burners, 14,843 had been fixed during the twelve months; and he was sure those who had invested their money in these burners had received full value for it. Incandescent burners were, at the consumers' desire, attended to by the Company's officers; and the charge was only 3d. per month per burner where there were upwards of six burners, and 4d. where there were less than six. A man attended twice in the month, looking after the globes, chimneys, and burners, and renewing the mantles; and in this way the consumer was assured of a beautiful light. The Welsbach burner only consumed 3¾ cubic feet of gas per hour, and gave a light of between 50 and 60 candles; costing, at the present price of gas, only 1d. for twelve hours' burning. He had recently had the opportunity of confirming his belief in the great advantage of this light. The Midland Railway had largely introduced Welsbach burners for station lighting; having supplanted during the last eighteen months 3620 5-feet burners and 1416 10-feet burners by 4343 Welsbach burners; and the gas saved by the change had been 47 million cubic feet, which, at 2s. 3d. per 1000 feet, the average price paid by the Company, represented £5313. After deducting the maintenance and the cost of the mantles, &c., there remained a saving of £2994. For street lighting, the Welsbach burner offered the best and cheapest light ever devised; and though gas companies had had difficulty in persuading lighting authorities to adopt it, they had pushed it regularly, and now, even in London, the worst-lighted city of the kingdom, he was glad to see the Welsbach street-lamp was at last being adopted. At Newcastle-on-Tyne, electric arc lamps for street lighting were being replaced by incandescent gas-lamps. At Hull, the Town Council had ordered 5-light incandescent gas-lamps; and the cost was to be only £9 per lamp per annum, against £20 paid for electric arc lighting. After alluding to the troublesome liability of electric lights to go out owing to stoppages of the current, and mentioning the loss at which some public authorities were carrying on electric light works, he referred to the recent complaints of Sheffield electric light consumers about their swollen accounts, the short life of the lamps supplied by the department, and to the inquiries as to whether preferential rates were in existence, and whether some consumers chose their voltage while others had the present higher voltage thrust upon them. The correspondence lately published on the subject of lighting in Sheffield also included, he said, a letter complaining of the Sheffield gas. The writer of this letter said that, with him, the gas was continually going out, that it gave a dull, yellow light requiring assistance from lamps or candles in an ordinary room, and that it damaged the wall-papers, picture-frames, &c., and blackened the ceilings in the course of a few months. In answer to all this, he (the Chairman) was prepared to say that the complaints were not true of Sheffield gas. They were not true in his own experience. His house was decorated 44 years ago, and the ceilings and walls had been cleaned once since. Gas had been burning every night when his family were at home; and the condition of the walls and ceilings was astonishing to everyone. Yet he burned the same gas as other people; he had no different method or process of burning it. He used incandescent burners, and more beautifully lighted rooms than his own he had never seen; while as for the cleanliness of the gas, they could not find better anywhere. If the writer of this letter thought he had bad gas, why had he not complained to the Company? Probably all the trouble was due to bad fittings, and want of attention to the burners. In November last, some fanciful statements were made, and figures published, to show how Sheffield had suffered by not taking over the gas-works in 1870. Whose fault was that? No one's but the Corporation's. The late Alderman Moore offered the shareholders 9 per cent. dividend when they had been receiving 10 per cent. for years, with a large amount of capital not called up. The offer was declined; and the Committee of the House of Commons, after they had heard the statement of the Corporation of Sheffield, never called upon the Gas Company to reply. They said the Corporation had no case, and they threw the Bill out. The consumers of gas in Sheffield ought to be thankful that they did not purchase the Gas Company. The Manchester Corporation bought the gas-works 60 years ago. To-day the price of gas in Manchester was 2s. 9d. per 1000 cubic feet, against 2s. in Sheffield. The Manchester undertaking paid £52,000 a year in relief of the rates; Sheffield, with its much smaller consumption, at the same price, might, after paying the dividends, hand over £102,000 towards the rates. The Nottingham Corporation purchased the gas-works 28 years ago. The price there in 1874 was 3s. 3d. per 1000 cubic feet, against 3s. 1d. in Sheffield; now it was 2s 10d., against 2s. The Nottingham gas undertaking handed over towards the rates £24,000 a year; and if the Sheffield Company charged 2s. 10d. per 1000 cubic feet, they could hand over £114,000 a year, even after paying the present dividend of 10 per cent. to the shareholders. These figures would show that Sheffield had not suffered by allowing a private Company to supply the city with gas. It was surely important that manufacturers should obtain gas at a reasonable and low price, more particularly when it was considered how largely gas engines were coming into use. There were now fixed in Sheffield 787 gas-engines, 405 of which did not use £10 worth of gas a year. He hoped more and larger engines would come into use. The total quantity of gas supplied for gas-engines last year was 189 million cubic feet; and the price of gas for use in them had recently been reduced to 1s. 8d. per 1000 cubic feet, provided each engine consumed £10 worth of gas a year. All to whom he had spoken on the subject, thought the Board had acted wisely in taking this step. A vast improvement was now going forward in the manufacture of gas-engines. The Westinghouse people had recently produced one with three cylinders, thus overcoming the intermittent running. The Gas Company had decided to offer to the Sheffield Technical School one of these new engines, so that the students—700 or 800 in number—and including many foremen, might see the great advantage it was to use these gas-engines, which required no boilers, no water, no chimney-stack, and no coal, and which enabled the user to calculate to a penny the outlay involved. A cheaper or better advertisement to promote the consumption of gas for power could not, he thought, be devised. From Bradford, the Company had received a letter describing a works where there was a steam-engine of 140 horse power, and a Crossley high-speed gas-engine of 30-horse power; while the counter-shafting for a foundry blower requiring 16 to 20 horse power was so arranged that it could be driven either by a gas-engine or an electric motor. The experience of these two motors was that for the 15-horse power motor (460 volts), taking current from the Bradford Corporation at 1d. per unit, the cost was nearly double that of gas at 2s. 2d. per 1000 cubic feet for the gas-engine performing exactly the same work. He would not say more on this subject; but it was obvious that there was a great future for gas-engines in this locality. One Sheffield firm already had two gas-engines of 120 horse power, one of 110-horse power, two of 70-horse power, one of 87-horse power, and one of 30-horse power. In conclusion, the Chairman spoke of the naphthalene trouble, which had continued to give the Board great anxiety. They had decided that they had been working in the wrong direction, and that they had been reducing the temperature of the gas as it came from the condenser more than it should be reduced. A raising of the temperature at two different stations had produced the same beneficial result; and at a third station, where no alteration had yet been made, the trouble was as bad as ever. Still, the Board were not over-sanguine, and did not wish to say they had removed the difficulty of naphthalene; but his firm belief was that they were now moving in the right direction, and that with perseverance they would succeed altogether. One thing he always liked to mention was that those gas consumers who wished to have good value for their money should see that their fittings were proper ones, and when out of order they should be replaced by new ones. The expense was not much; but the benefits of a good light were sure to be appreciated.

Sir H. STEPHENSON seconded the resolution; and it was carried.

A dividend at the rate of 5 per cent. on the "A," "B," and "C" stocks (equal to 10 per cent. for the year), was then sanctioned.

The CHAIRMAN, replying to a vote of thanks for presiding, said he was sincerely gratified by the vote, which he was sure included his colleagues on the Board as well as himself, and also the officers of the Company, who had worked cordially and heartily together, with a result satisfactory, he thought, to all concerned. It was so to himself. Each year they found very little to complain of with regard to the gas supplied and the business management of an undertaking so large as the Sheffield Gas Company.

HASTINGS GAS COMPANY.

The Meeting of this Company was held on the 6th inst., under the presidency of Dr. GRAY, J.P.

The CHAIRMAN, in moving the adoption of the report and accounts (which were noticed last week, p. 647), said that, though there was an increase in the quantity of gas sold, the rental showed a decrease of £2948. This was owing to the reduction in price to the former charge of 3s. per 1000 cubic feet. Had they not made this reduction, the balance-sheet, instead of a decrease, would have shown an increase of £558; and whereas the price they paid for coals when they originally reduced the price of gas to 3s. was 17s. 8d. a ton, it was now 21s. 8d.—the sum of which represented considerably more than the whole of the decrease. On the expenditure side, there has been a saving of coal and oil of £3879, or more than sufficient to meet the whole deficiency of rental. During last year, economy had been practised in every conceivable way. Other savings made the expenditure less by £4301. On

the revenue side, the hire of stoves and meters showed an increase of over £200. Residuals, unfortunately, exhibited a decrease of £1928. There was a profit balance of £9412 on the half year. The proposal to pay the old rate of dividend before the temporary rise, required no explanation. Though the increase of something over 3 million cubic feet in the amount of gas sold was small compared with what it had generally been, they must bear in mind that a decreased sale had been almost universal throughout the kingdom; and it was, to a considerable extent, due to the mild and bright winter. During the slight cold weather a week or so ago, they had an increase on their sales of 1¼ million cubic feet. They heard a good deal of empty houses. Various estimates had been given; but they might take it that 800 in the town did not err on the side of being too much. If only half of these were occupied by gas consumers, using the average amount, they would represent a loss of 8½ million cubic feet during the half year, or equal to a gas-rental of £1272. On various items, a steady increase was shown. For instance, during the year there had been 375 consumers; and during the half year 136 additional cooking stoves, and 116 more slot meters. Incandescent gas lighting, with all its advantages, had been spreading rapidly in the town; and this accounted in a considerable measure for the decrease. Under all the circumstances, the half-year's working had been satisfactory; and the Directors and shareholders might well congratulate themselves on the position of the Company.

The report and balance-sheet were adopted; and the Directors were afterwards authorized to issue, for the purposes of the new works at Glyne Gap, such portion of the capital named in the Company's Act of 1899 as would realize £50,000, together with the amount of debenture stock permitted.

A vote of thanks to the Chairman, Directors, officers, and staff was responded to by the CHAIRMAN and the ENGINEER (Mr. C. E. Botley).

DOVER GAS COMPANY.

The Half-Yearly Meeting of this Company was held on the 3rd inst., under the presidency of Mr. WILLSHER MANNERING.

The CHAIRMAN, in moving the adoption of the report and accounts, which were referred to last week (p. 647), said he met the shareholders that day with a much more favourable report than on the previous occasion, when, owing to the high price of coals, there was a deficiency of £1244, and they had to draw on the reserve fund to this extent for the payment of the dividend; whereas the accounts now presented showed a net profit rather more than sufficient to meet the dividend. As compared with the corresponding half of 1900, the total receipts were £25,031 against £25,411, or less by £380. The total expenditure was £22,077, against £22,524, or less by £447, thus showing an increased net profit of £67. The revenue showed an increase in gas-rental of £182; while meter and stove rentals increased by £177. On the other hand, there had been a falling off in residuals of £739, chiefly owing to the lower value of coke. The expenditure side, on the whole, showed a decrease in cost of manufacture, including coal, of £209. Distribution was reduced by £695, owing to the less amount required for maintenance and renewals of mains and services; and public lamps were less by £25. Rates and taxes were more by £71, management charges more by £39, and sundries £85 more—leaving a balance to profit and loss of £3849, against £3498. After paying interest on loans and income-tax, they had a net profit for the half year of £2954, which was sufficient to pay the dividend and leave a balance of £36 to be carried forward. During the six months, 11,585 tons of coal were used, against 11,464 tons in the corresponding period, at a reduced cost of 8½d. per ton. The quantity of gas sold was 118,224,100 cubic feet, against 117,103,000 cubic feet, or an increase of just upon 1 per cent. The percentage of increase, though not great, was satisfactory when they considered the small number of troops in garrison, the mild weather, and the competition of the electric light, all of which had contributed to restrict consumption. There had been a steady expansion of prepayment meter supplies. During the half year, 194 additional meters were fixed; the year's increase being 398. The total number of meters, automatic and ordinary, in use at the end of the year was 5041; and the number of cookers and heaters on hire was 4050. On capital account, they had expended £7943 on account of the new tank and gasholder, £1534 on new and additional mains and services, £120 on permanent works, and £1657 as the cost of the new Act. The Directors were glad to report the completion of the new holder, which would be most useful and advantageous to the Company. Additional storage was much needed for safe and economical working. With regard to the sale of new stock, of the £10,000 worth offered, £8132 was sold at a premium of 60 per cent., a result which he thought might be regarded as satisfactory. The prospects for the current half year were very promising. Besides earning the dividend, they hoped, by the saving that would be made in the cost of coal, to replace in the reserve fund the greater part, if not the whole, of the amount withdrawn for dividend in the past.

The motion was adopted, and the usual dividend at the rate of 7½ per cent. per annum was declared.

When Manchester was suffering from the effects of the drought last year, it was repeatedly pointed out that an abundance of water was available in the strata of the Manchester district; and it was strongly urged that these should be utilized. As a striking confirmation of the opinions then expressed, it will be interesting to mention the following instance where these underground supplies have been made available with the most satisfactory results. A local firm, who were, and had been for years, paying to the Manchester Corporation £120 per annum for water, decided to test the supplies in the strata immediately below their works, and for this purpose consulted a local hydraulic engineer. A boring was made, and a supply found amply sufficient to replace what had been previously obtained from the Corporation. The cost of boring, tubes, and pump was not more than about £90; so that the firm, on the first year's operations, will save £30 on the cost of the Corporation supply, which is being stopped.

RICHMOND GAS STOVE AND METER COMPANY.

In moving the adoption of the report and accounts (which were noticed in the "JOURNAL" for the 4th inst., p. 586) at the annual meeting of the Company last week, Mr. E. W. T. Richmond, the Chairman, said that the result of the working of the past year had not been so good as that of the previous twelve months. About March last, very strong pressure was brought to bear upon the Company, in conjunction with other manufacturers in the same line of business, to reduce their prices; and though the Company carried a heavy stock of raw materials bought at high rates, they had, in face of this pressure, to take off the advance before they should have done so. The result of this was shown in the decreased profit. After referring to the taking over by the Company of the businesses of Messrs. George Glover and Co., Limited, Messrs. W. & C. Staples, and Messrs. George Newton, Limited, the Chairman said that, as regarded the stove branch of the undertaking, there was no doubt the Company had a large field before them. There were something like 3,200,000 ordinary consumers, and over 900,000 automatic consumers of gas. These 4,000,000 consumers had among them about 1,000,000 stoves; and it had taken thirty years to place this number. The Directors thought that the time had come when the money they spent on behalf of gas companies throughout the country should be reduced; and they did not intend this year to spend so much as they had done on previous occasions. The past twelve months had been a very critical period. Gas companies had had to face the effects of dear coal, which they were forced to buy in the early part of last year. This had made them careful in the matter of buying stoves and meters, and had left them frequently in the position of not being able to raise money except on terms which they did not care for; and it had made them additionally careful about investing money in stoves, and thus developing their business. The report and accounts were adopted, and dividends of 6 per cent. on the preference shares and 10 per cent. on the ordinary shares were declared. A special meeting of the Company was afterwards held for the purpose of approving of the new Articles of Association necessitated by the changes in the position of the undertaking and of the Companies Acts.

JOHN WRIGHT AND EAGLE RANGE, LIMITED.

The Annual General Meeting of this Company was held in Birmingham on the 7th inst.—Mr. G. E. Wright in the chair. In moving the adoption of the report (see *ante*, p. 586), he said he thought there was even more reason for congratulation than there had been in past years, because 1901 had been a very difficult year for all manufacturing companies. Two years ago there was an extraordinary rise in the cost of all raw material, and they were compelled to raise their charges from 7½ per cent. to 10 per cent.; but this did not quite meet the increased cost. Their business was somewhat peculiar; for, owing to special circumstances, their customers were not in a position to raise their prices, and, early last year the Company deemed it advisable to give them the advantage of the falling market. Early in the year they decided that the interests of the shareholders would be best served by reducing prices to a normal level, notwithstanding the fact that raw material had not nearly reached former prices, and had been subject to considerable fluctuations. The Directors had been fortunate in being able to take advantage of these fluctuations, and they were in a position at the end of the year to show their shareholders a result which, he thought, was the best they had ever presented. Another cause of difficulty during the past year was the high price of gas, which had tended to check the rapid increase in the use of gas stoves. There was now, however, every indication that the charge would be lowered. The report and accounts were adopted.

DAVIS GAS-STOVE COMPANY, LIMITED.

The Chairman of this Company (Mr. H. J. Davis), when moving the adoption of the Directors' report at the second annual meeting held a few days ago, remarked that, though it was a satisfactory one, he would have had greater pleasure if it had been better. At the same time, he and his colleagues were fully satisfied with the results obtained. Certain circumstances had affected the Company as they had done others; and although there was an improvement of £414 in the gross profit account, there was an increase of £4000 odd on the year's trading expenses. As to this, he might perhaps point out that the sales amounted to about £4000 more than they did in 1900. Of course, the expenses to carry on this additional amount of business had augmented considerably. A deep-rooted idea took possession of some of the Company's best customers at the commencement of last year that, owing to a fall in the price of metals, gas-stove makers should remove the 7½ per cent. which had been previously put on the net amount of every invoice on account of a very considerable rise during a previous period. Much pressure was brought to bear; and the result was that on the 10th of March the added 7½ per cent. was reduced to 5 per cent., and a month later the Directors were compelled, much against their better judgment, to withdraw the rest. The reduction had cost them more than £5000 in the matter of deficiency of revenue. When he mentioned that the Company had increased their sales something like £4000 compared with the year 1900, he was sure the proprietors would agree with him that the Directors and the principal employees, with whom the Board were glad to associate themselves, had furthered the interests of the concern to the best of their ability. In conclusion, he pointed out that there had been added £2000 to the reserve; and an available balance of £1585 was carried forward. He proposed the adoption of the report and accounts. Mr. C. W. Davis seconded the motion, and it was carried. The payment of a dividend of 8 per cent. per annum was then authorized, and the proceedings closed.

The Directors of the Bristol Water-Works Company have resolved to recommend dividends for the half year to Dec. 31 last of 7½ per cent. per annum on the ordinary shares, and of 5¼ per cent. per annum on the 7 per cent. maximum consolidated ordinary stock.

THE WATER-GAS PLANT AT CARLISLE.

At the Meeting of the Carlisle Town Council last Tuesday, the Gas Committee reported that they had received a letter from Messrs. Corbet Woodall and Son, stating that the works in connection with the carburetted water-gas plant were in such a condition that the manufacture of the gas could be commenced at any time. They also announced that they had accepted, subject to a month's satisfactory trial, the tender of the Pumpherston Oil Company (Glasgow) for the supply of about 600 tons of gas oil, at 2⅛d. per gallon if supplied in Corporation tank-waggons, or 2⅜d. per gallon if delivered in barrels. The Committee had also accepted the tender of Messrs. Hurst, Nelson, and Co., of London, for two oil tank-waggons. Mr. Corbett, in moving the confirmation of the minutes, referred to the proposal to purchase oil tank-waggons. He said that by so doing they were able to save ½d. per gallon, and all the labour of unshipping the barrels was dispensed with. Mr. White complimented the Committee on the favourable contract they had been able to enter into for the supply of oil for the manufacture of water gas. About 18 months ago, they were told by an expert that the price of oil was 5¾d. per gallon, and was still going up; whereas on the day of the long discussion there on water gas it was 3½d., and was falling. It had evidently been still going down, for the Committee had made a contract at 2⅛d. per gallon. To show how favourable this was to them, he would remind them that when they were advised as to water gas, they were told that to make 1000 cubic feet it would take 3½ gallons of oil at 5¾d. per gallon, or 1s. 7¼d., and 5¾d. for labour and other materials—making a total of 2s. 1d. per 1000 cubic feet. If they took it at the price at which the Committee were able to buy their oil, it worked out at 7½d. for the oil; and allowing 5¾d. for labour and materials, as before, it made a total of 1s. 1¼d. per 1000 feet, compared with the 2s. 1d. they were told. As the coal gas last year cost them practically 2s. per 1000 cubic feet, he urged the Committee to get on with the manufacture of water gas as early as possible, seeing that they would make an extra profit of 11d. per 1000 feet, for he could assure them they wanted this profit badly.

WALSALL CORPORATION GAS SUPPLY.

The Past Year's Working.

At the Meeting of the Walsall Town Council on Monday last week, the report and annual financial statement of the Gas Committee were submitted. The Committee expressed regret at reporting that the net profit, after allowing for interest on loans and the sinking fund, amounted to only £1514, against £2449 last year. The decrease, the Committee state, was due mainly to the fact that the works had to be remodelled and brought up to date. The outlay thus incurred amounted to almost £38,000, the bulk of which was unproductive until nearly the end of the year. In addition, coal had cost more per ton, as contracts had been made at the higher rates which previously ruled; while residual products had realized less, owing to their reduced value. Increased wages represented £1100. These items practically absorbed the additional receipts for gas supplied; and, but for economy in working, the profit would have been less than that stated. The Committee did not recommend any reduction in the general charge for gas, but proposed that the price of that supplied for motive power or manufacturing purposes, except lighting, should be lowered to the extent of 3d. per 1000 cubic feet.

In moving the adoption of the report, a few explanatory remarks were made by Alderman T. P. Brownhill. He said the quantity of gas manufactured was 480,530,000 cubic feet, which was an increase of 27,559,000 cubic feet, or about 6 per cent., compared with the previous year. The quantity of coal carbonized was 50,072 tons—being a decrease of 1584 tons; and there was an increase in the quantity of gas made from each ton of coal used. This saving represented 4455 tons of coal, or £3601; and other economies which had been effected raised the total curtailment of expenses to £5379. In consequence of less coal having been used, there had been less coke and tar made, and the receipts under these headings accordingly showed a decrease of £2000; leaving a net saving of about £3300. This was the most satisfactory year's working of the concern since 1896; and the Council would perhaps ask how it was that, under these circumstances, the amount of profit was so small. To show how the money had been spent, he mentioned that the wages of the workmen had been increased by £1100; the opposition to the Mond Gas Bill cost the Committee £650, alterations to the works for new machinery to be fixed represented £1375, and £756 had been paid as interest on an additional loan of £38,000, which had been expended in improving the works. Altogether, the exceptional outlay amounted to £5786, and it was responsible for the profits being £3000 less than they otherwise would have been. The price of coal had been one of the most important factors which accounted for the increased expenses. Compared with the year 1897, the Committee had to pay £15,000 more for coal; and an increase in the price of gas only made up £5000 of the difference.

In the course of the subsequent discussion, Mr. Thomas remarked that the Council had about £250,000 invested in the gas-works, and the ratepayers were entitled to from £4000 to £5000 from them in interest alone. If they were not receiving this, there was something either lacking in the management, or the consumers were being subsidized at the cost of the ratepayers. For some years the profit had not reached £3000; and no one would accuse the Committee of having over-provided for depreciation. Beyond this, there were complaints as to the quality of the gas supplied; while the charge for it did not err on the side of cheapness. Alderman W. Brownhill said the fact was that the gas-works would never be a fruitful source of revenue so long as colliery companies made such enormous profits. Birmingham, in 1900, only realized a profit of £500; and the reason simply was that they, like Walsall, had to pay an extortionate price for their coal. Mr. Millerchip said the Gas Committee had made a mistake in not placing a sufficient sum to the reserve fund, so that the works could have been kept in an efficient state without such an outlay in respect of one year's working as that which had been incurred.

The report was approved *nem. con.*; and the Committee's recommendation to allow a reduction of 3d. per 1000 cubic feet for gas supplied for manufacturing purposes was agreed to.

GERMAN CONTINENTAL GAS COMPANY.

Report and Accounts for 1901.

We have received, through the courtesy of Herr W. von Oechelhaeuser, the General Manager, a copy of the annual report and balance-sheet to be submitted on the 19th inst. to the forty-seventh annual general meeting of this Company.

The recent phenomenal growth in the sales of gas and in the profits realized by the Company, culminating in an increase of 8·44 per cent. in the amount of gas made in 1900 over that in 1899, and in a dividend of 14 per cent. in 1900, as compared with 13⅓ per cent. in 1899 and 12½ per cent. in 1898, has received a check during the past year. The increase in the production of gas was 5·23 per cent.; whereas the average annual increase during the immediately preceding decade was 6·05 per cent. The falling off is attributed mainly to the depression in industrial circles, as the consumption of gas in factories declined especially in manufacturing districts. The returns from bye-products have not been adequate to compensate for the high price of coal. Owing to the mildness of the winter at the close of the year, the price of coke was depressed; while the continuance of the South African war lowered the value of cyanogen. The net profit for the year was 3,115,574·69 marks (about £151,980), which is a decrease of 157,212·81 marks (or about £7670) on that of the preceding year. The report recommends the distribution of a dividend at the rate of 12 per cent. for the year.

The increase in the number of burners in use was considerably less than in the two preceding years, but more than the average annual increase during the last decade. A new gas-works was put in operation at Rheindahlen, a small place in the Rhine Provinces. It is managed from the Company's establishment at M. Gladbach, from which four other works are also administered. The Municipality of M. Gladbach have, however, decided to supply that town from their own works from the 31st of December, 1903, when the Company's concession expires. Three offers on the part of the Company for a renewal of the concession were rejected.

Further advances have been made, the report states, in the construction of mantles and incandescent burners; so that now a given light is obtainable for about half the consumption of gas requisite with the incandescent gas-burner of 1892, or about one-fourteenth the consumption in the old flat-flame burner. Chemical self-lighting devices for gas-burners have become so reliable and cheap that they deserve the most extensive adoption; while electric devices for lighting burners at a distance have improved. The quantity of gas sold by prepayment meters amounted to 113 million cubic feet; and the extension of this class of business tended to neutralize the effects of industrial depression on the sale of gas. The pension fund for officials of the Company was subjected to revision, by which its provisions and scope were considerably extended. The Company's gas-fitters' school at Dessau, which has accommodation for thirteen pupils, furnished well-trained fitters for several vacancies on the Company's staff. Advances have been made during the year in methods of purification, and in the further utilization of bye-products at the Company's chemical works at Warsaw, as well as in the construction of retort-settings. Some of these improvements have been protected by letters patent. The Company own at the present time twelve valid German patents, a number of patents of other countries, and 23 registered designs; while six more German patents have been applied for. Many of these are already being profitably worked. Those for improvements in gas manufacture are applied at the Company's works and elsewhere; while others, and the registered designs, are applied at the Company's central workshops at Dessau.

The gas sold for illuminating purposes increased by 6·53 per cent. as compared with the preceding year, and now amounts to 73·64 per cent. of the total make of the Company. That sold for heating and power purposes increased by only 4·71 per cent., and amounted to 21·96 per cent. of the total production. Unaccounted-for gas was 4·4 per cent. of the total. The make at the twelve places or districts supplied by the Company was 2,140,531,500 cubic feet. The length of mains was considerably extended. The average consumption of gas per burner fell from 3080 cubic feet in 1900 to 2970 cubic feet. The number of gas-engines in use was 1087—an addition of 36—representing an increase of 570-horse power. The yield of gas per ton of coal carbonized was about 10,760 cubic feet; this being a slight improvement on the preceding year's working. The coke used for firing the retorts increased, however, from 16·71 to 16·87 per cent. of the weight of coal carbonized. The Company's electricity supply station at Dessau raised its output by 25·1 per cent.

The balance brought forward from 1900 was 45,623·03 marks (about £2225); and, as already stated, the net profit for the year was about £151,980. The customary contributions to the reserve, renewal, and contingency funds have been made; and after payment of Directors' fees, and providing for the dividend at the rate of 12 per cent. per annum, a balance of 21,199·87 marks (about £1034) will remain to be carried forward to the current year's account.

Among the more important towns supplied by the Company are Frankfort-on-Oder, Potsdam, Dessau, M. Gladbach, Warsaw, Erfurt, and Ruhrort.

Water Scheme for Braunton.—A water-supply scheme has just been completed at Braunton, near Barnstaple. At a point about 1½ miles from the centre of the village, a reservoir has been constructed, the storage capacity of which is 114,000 gallons. Springs yield a minimum flow of 18,000 gallons a day. Mains 5 inches in diameter convey the water to the village. The total cost has been nearly £5000; the contract price being £3466.

ARCHITECTS AT THE GRANTON GAS-WORKS.

The members of the Edinburgh Architectural Association, to the number of about seventy, recently paid a visit to the new gas-works of the Edinburgh and Leith Gas Commissioners at Granton. Travelling by rail and on foot, they arrived at the south-east corner of the gas-works, where they were met by Mr. W. R. Herring, who assumed the leadership of the party. At a convenient point inside the works, Mr. Herring gave a general description of what was being done, mentioning that the site extended to 105 acres, and that the buildings which have been erected are the first of seven sections which are contemplated, and which, at the present rate of progress, should make provision for the gas supply of the district for the next fifty years. He then conducted the party over the works, and at various points in the progress he described the apparatus which has been or is being erected, and showed how both buildings and plant had been designed so as to promote efficiency and effect economy in working. As the works have been already very fully described in the "JOURNAL," it will only be necessary to indicate the progress which has been made in their construction during the six months which have elapsed since the visit of the Institution of Gas Engineers in September last. The railway station building inside the works, the upper part of which is to be both a covering to the platform and a general store, has been roofed in; and the turnstiles and checking apparatus for the workmen, as well as the overhead foot-bridge to give access to the retort-house, are about to be proceeded with. The retort-house has been completed; and the bench has been under low heat for about a month. By May, it will be fit for the production of gas, and may be so used if the other parts of the works are sufficiently forward. The horizontal condensing tubes in the roof of the retort-house are all fitted up. In the apartment at the south end, two water condensing boxes and two exhausters have been all but finished. The coal-conveying plant is workable; and at present the hot-coke conveyor upon the discharging floor of the retort-house is being put in. In the coal-store adjoining, one set of Stirling boilers is ready for work, and another set has already been begun. Adjoining the boilers, machinery for the making of briquettes, provided by Messrs. Graham, Morton, and Co., Limited, is ready for erection. In the compartment at the south end of the coal-store, two scrubbing cylinders by Messrs. W. C. Holmes and Co. are in position; and cyanide recovery plant is about to be laid down. The purifier-house is in the most backward state. Several of the boxes are almost ready for use; but the roof of the building has still to be slated, and the work of putting in the floor of the upper flat, which is to be used as a revivifying stage, and which is to be constructed of concrete and expanded iron, is begun. The pumping-station is nearly complete; two gas-engines, by Messrs. W. Grice and Son, being in position, all but the friction gearing, which is in process of being fitted. The station meter is ready for the reception of the two station meters by Messrs. R. Laidlaw and Son; and the base of one of these has been put in. The gasholder (which was erected by Messrs. Clayton, Son, and Co.) has been in use for several months. It was three-fourths full on the occasion of the visit. The party then inspected the residual products works, which are conducted in a building the beautiful design of which was greatly admired by the visitors. Leaving the works at the north-west corner, a look was taken at the old marine quarry, which the Commissioners have power, if they think it desirable, to convert into a harbour for their own use.

CONDITIONS OF SAFETY FOR ACETYLENE GENERATORS.

The following is the appendix to the report of the Committee on Acetylene Generators, dealt with elswhere (*ante*, p. 693), in which the Committee set forth the conditions which a generator should fulfil before it can be considered safe:—

1.—The temperature in any part of the generator, when run at the maximum rate for which it is designed, for a prolonged period, should not exceed 130° C. This may be ascertained by placing short lengths of wire, drawn from fusible metal, in those parts of the apparatus in which heat is liable to be generated.

2.—The generator should have an efficiency of not less than 90 per cent., which, with carbide yielding 5 cubic feet per pound, would imply a yield of 4·5 cubic feet for each pound of carbide used.

3.—The size of the pipes carrying the gas should be proportioned to the maximum rate of generation, so that undue back-pressure from throttling may not occur.

4.—The carbide should be completely decomposed in the apparatus, so that lime sludge discharged from the generator shall not be capable of generating more gas.

5.—The pressure in any part of the apparatus, on the generator side of the holder, should not exceed that of 20 inches of water, and on the service side of same, or where no gasholder is provided, should not exceed that of 5 inches of water.

6.—The apparatus should give no tarry or other heavy condensation products from the decomposition of the carbide.

7.—In the use of a generator, regard should be had to the danger of stoppage of passage of the gas and resulting increase of pressure which may arise from the freezing of the water. Where freezing may be anticipated, steps should be taken to prevent it.

8.—The apparatus should be so constructed that no lime sludge can gain access to any pipes intended for the passage of gas or circulation of water.

9.—The use of glass gauges should be avoided as far as possible, and, where absolutely necessary, they should be effectively protected against breakage.

10.—The air space in a generator before charging should be as small as possible.

11.—The use of copper should be avoided in such parts of the apparatus as are liable to come in contact with acetylene.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 694.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 13	6½	Bombay, Ltd.	6¼—6⅝	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New	188—193	+1	4 13 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—133	..	3 15 2
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	112—115	..	3 9 7
220,000	Stk.	Mar. 13	10	Brighton & Hove Orig.	202—207*	−3	4 16 7
246,320	,,	,,	7	Do. A. Ord. Stk.	147—152*	..	4 12 1
420,000	20	Sept. 27	10	British	41—42	..	4 15 3
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c.	23—25	..	4 16 0
82,850	10	,,	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	10—10½	..	5 14 3
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	Mar. 13	8¼	Cagliari, Ltd.	21—23*	..	7 3 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	268—273	..	4 7 11
236,425	,,	,,	9	Do. New do.	205—210	..	4 5 9
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	160—165	−2	5 9 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 27	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
486,090	10	Jan. 30	10½	European, Ltd.	18½—19½	..	5 7 8
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Feb. 13	4⅛	Gas-light and Coke — 4 p.c. Ord.	91—93	..	4 14 7
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	8)—91	..	3 16 11
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	110—113	..	3 10 10
4,193,975	,,	Dec. 13	3	Gas-light and Coke — 3 p.c. Con. Deb.	91—93	−1	3 4 6
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 13	10	Imperial Continental	208—211	..	4 14 9
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 27	10	Liverpool United A	227—229	..	4 7 4
718,100	,,	,,	7	Do. do. B	167—170	..	4 2 4
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	118—120	..	3 6 8
75,000	5	Dec. 13	4	Malta & Medn., Ltd.	4½—5	..	4 0 0
560,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	107—111	..	4 10 1
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,193,832	Stk.	Feb. 21	4⅜	Newc'tle & G'tesh'd Con.	10 —107	..	4 1 9
346,855	Stk.	Dec. 27	3½	Do. 3½ p.c. Deb.	98—103	..	3 10 0
150,000	5	Nov. 28	8	Oriental, Ltd.	7½—8	..	5 0 0
135,000	4½	,,	8	Do.	6¾—7¼	..	4 19 4
15,000	1	,,	8	Do.	1¼—1⅜	..	4 11 5
60,000	5	Mar. 13	7	Ottoman, Ltd.	6—6⅜*	+⅛	5 7 8
					* Ex. div.		
851,070	10	Oct. 11	7	GAS COMPANIES. River Plate Ord.	10½—11	..	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd.	12—13	..	6 3 1
135,000	Stk.	Sept. 12	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	243—245	..	4 1 8
523,498	,,	,,	10	Do. C	242—244	..	4 2 0
5,850,000	Stk.	Feb. 13	5	South Met., 4 p.c. Ord.	122—125	−1	4 0 0
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	92—94	..	3 3 10
380,940	Stk.	Nov. 13	5	Southampton Ord.	104—108	..	4 12 7
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	100—102	..	3 17 8
120,000	Stk.	Feb. 27	5½	Tottenham and Edmonton — A. 5 p.c.	120—125	..	4 8 0
260,520	,,	,,	4	Tottenham and Edmonton — B. 3½ p.c.	93—98	..	4 1 8
182,380	10	Jan. 16	5	Tuscan, Ltd.	7—8	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—100	..	5 0 0
230,000	5	Mar. 13	9	West Ham, 10 p.c.	9—10*	..	4 10 0
172,000	10	,,	6	Do. 7 p.c.	12½—13¼*	+¼	4 8 11
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11½	Chelsea, Ord.	310—320	+5	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,720,560	Stk.	Oct. 11	8†	East London, Ord.	238—2 3	+6½	3 15 1
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb.	97—99	..	3 0 7
700,000	50	Dec. 13	8	Grand Junction — 10 p.c. max.	115—120	+3	3 6 8
310,000	Stk.	Sept. 27	4	Grand Junction — 4 p.c. Deb.	127—132	..	3 0 7
708,000	Stk.	Feb. 13	16	Kent	300—310	..	5 3 3
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max.	290—300	+5	3 10 0
406,200	100	,,	8	Do. 7½ p.c. max.	210—220	..	3 12 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 13	12.5/10	New River, New Shares	405—415	..	3 1 8
1,000,000	Stk.	Jan. 30	4	Do. 4 p.c. Deb.	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall — Ord.	195—205	+5	3 8 4
126,500	100	,,	7	South-wark and Vauxhall — 7½ p.c. max.	185—195	+5	3 11 10
489,200	Stk.	,,	5	South-wark and Vauxhall — 5 p.c. Pref.	155—160	..	3 2 6
1,019,585	,,	Oct. 11	4	South-wark and Vauxhall — 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex	295—305	+10	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Mar. 13	3	Do. 3 p.c. Deb.	95—97*	+½	3 1 10
					* Ex. div.		

† Next dividend wil be at this rate.

THE CHANGING USE OF GAS.

A recent number of the "Scientific American" contained an article by Mr. Alton D. Adams on the above subject. The aim of the author was to show that since the introduction of electric lighting gas has gradually left the field of illumination, in order to enter one where its heating qualities can be used to greater advantage. He supported his point by quoting, from the reports of the Gas and Electric Light Commissioners of Massachusetts, statistics showing the changes in the number of public gas-lamps and of gas-stoves used in the State during the past fourteen years. The figures are as follows:—

Year ending June 30.	Public Lamps.	Gas-Stoves.	Gas-Stoves in Boston.
1887	18,990	2,378	..
1888	18,335	4,003	..
1889	17,260	6,328	..
1890	15,493	7,418	..
1891	14,107	8,666	..
1892	13,324	10,795	..
1893	12,971	12,880	..
1894	12,700	15,877	..
1895	11,701	42,563	23,881
1896	11,693	72,195	49,610
1897	11,988	78,667	53,350
1898	12,407	79,335	47,698
1899	12,876	87,201	47,635
1900	13,308	95,547	48,064

Commenting on these figures, he points out that for the financial year 1887, the number of gas-lamps throughout the State was 18,990; but for 1900, thirteen years later, it was only 13,308—a decline of 30 per cent. This decrease took place in spite of a rapid rise of population during the period under consideration. Quite different from the declining use of gas-lamps, however, has been the application of stoves. For the year 1887, the number reported was only 2378; while for 1900 it was 95,547. That is, during thirteen years the number grew to more than forty times the original magnitude. In the seven years from 1887 to 1894, it increased to 15,877; the average yearly addition being nearly equal to the original. Of the stoves included in the report for 1895, 23,881, or a little more than one-half, were in use in Boston. Near the close of the financial year 1894, one of the Boston Gas Companies, under the spur of competition, offered gas-stoves to their consumers on very favourable terms. This action no doubt had much to do with the large increase in the number used in 1895 and 1896. How many stoves were brought into use in Boston from 1894 to 1895 cannot be stated; but from 1895 to 1896 the number was 25,729, or more than the entire number there in 1895. During the year just considered, the number of stoves throughout the State, including those in Boston, increased from 42,563 to 72,195, or 29,632. It follows that the stoves added throughout the State outside Boston numbered only 3903, or less than one-sixth of the increase in that city. In 1896, the severe competition in Boston came to an end, and the maximum number of gas-stoves there was reached in 1897, when it stood at 53,350. Since that date the number has declined; and stood at 48,064 in 1900. At the time of severe competition, stoves were installed in Boston without any charge, and under contracts that the ownership should pass to the users when gas to a certain value had been consumed. The small decrease in the number of gas-stoves used in Boston is probably due to failures of some consumers to burn enough gas to earn the stoves. Outside Boston, the increase has been constant and rapid—from 22,585 in 1896 to 47,483 in 1900; thus more than doubling in four years. This increase is the more instructive because it has come about simply through the natural demand. In 1897, Boston had 67 per cent. of all the gas-stoves in the State; but in 1900 this figure had fallen to 50 per cent. Boston still has four times as many gas-stoves per unit of population as the rest of Massachusetts, since its number of inhabitants is only one-fifth of that for the entire State.

EAST LONDON WATER WORKS COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the half-yearly general meeting on Thursday, it is stated that, in the six months ending Dec. 25, 3637 new services were laid on, compared with 3951 in the corresponding period of the previous year—bringing the total up to 216,631. The construction of the Banbury and Lockwood reservoirs was pushed forward vigorously during the period covered by the report; and the large filling conduits were completed and brought into use for supplying the old reservoirs. The whole of the pumping plant and works were kept in good condition. With regard to the London Water Bill, the Directors inform the shareholders of its second reading on the 3rd inst., and assure them that everything was done to safeguard their interests up to this point, and that all necessary watchfulness will be exercised on their behalf when the measure is before the Joint Committee to whom it has been referred. The accounts accompanying the report show that the water-rates amounted to £208,316, against £195,916 in the latter half of the year 1900; being an increase of £12,400. The total revenue, including the balance of £4000 brought forward, was £209,343, compared with £197,517 in the corresponding period of 1900; being an increase of £11,826. The expenditure on maintenance was £93,911, and on management £16,556—together, £110,467; the previous items being £66,948 and £14,903, making a total of £81,851, or a difference of £28,616. The amount paid for water purchased from other Companies by reason of the drought last year was £25,005; so that there was a normal increase of £3609. In calling attention to this large

CARBURETTED WATER-GAS APPARATUS

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The Economical Gas Apparatus Construction Co., Ld.

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W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

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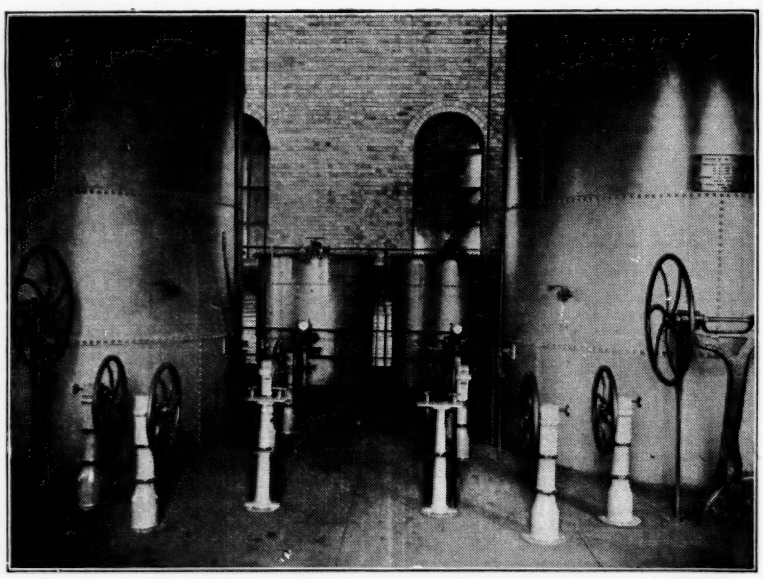


RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One-Fifth Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 12 MILLION CUBIC FEET.

additional item, the Directors express their gratification at the fact that it prevented interruption in the constant service of water in the Company's district. But, notwithstanding this heavy and abnormal expenditure, the vitality and growth of the Company enable them to recommend not only an increase of 1 per cent. per annum in the dividend for the half year, which will be at the rate of 8 per cent. per annum, but also to carry forward £17,474 to the next account.

ELECTRIC LIGHTING NOTES.

Electricity in St. Paul's.

It is confidently expected that on Easter Eve (the 29th inst.) the electric light will be switched on in St. Paul's Cathedral for the first time. Only a portion of the interior, however, will then be electrically lighted; for though the whole of the wiring is done, delay in supplying the lamps has prevented the completion of the work, and it is believed that it will probably be next winter before the whole is finished. The fittings have been made from designs furnished by the Cathedral Architect. It will cost about £10,000 to alter the lighting of the Cathedral from gas to electricity; and this charge, as already mentioned, will be borne by Mr. J. Pierpont Morgan.

More Money for Electricity at Southport.

Last Tuesday, Colonel Durnford, one of the Local Government Board Inspectors, conducted an inquiry at Southport into an application of the Corporation to borrow, for the purposes of extensions, &c., at their electricity supply works, a further sum of £32,000. There was no opposition. On the 31st of March last, the electricity account showed that the total borrowing powers, under the Public Health Act of 1875, were £149,600. The capital expended was £133,036 (including mains, £41,922; buildings, £21,112; machinery, £39,049; and tramway plant, £10,063); and the amount available for borrowing was £21,100. Of the total capital, £117,815 still remained on mortgage. During the past year, there have been great extensions at Crowlands; and on the 31st inst. the balance of the borrowing powers will have been expended. About £8998 of the amount applied for has already been spent.

Agitation at Kingston.

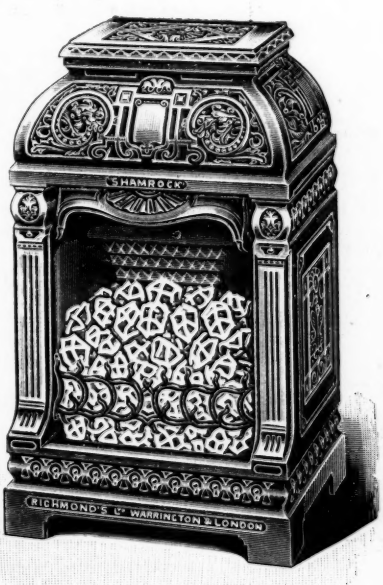
The burgesses of Kingston do not seem to take more kindly to their municipal electric light undertaking as time goes on. Last year the installation made a loss of £2700; and now the Town Council have resolved to extend the arc lighting system in the town. This is no doubt an ingenious idea, and may improve the look of the next balance-sheet of the undertaking; but considering that for ten years prior to the introduction of electricity the lighting rate was only 6d. in the pound, whereas last year it reached 10d., it is hardly surprising that the ratepayers are beginning to bestir themselves. As a consequence of this activity, a public meeting was held last week, at which the proposed extension of the arc lighting was condemned, and the Town Council were requested to take into their earnest consideration (1) the advisability of discontinuing the whole system of arc lighting in the streets, and (2) the means to be taken to make the electric light undertaking a commercial success. We fear that the second "request" will prove a "poser" for the Council.

Slot Meter Electricity Supplies in the North.

In the course of the evidence given on the Northumberland Electric Power Bill and the Newcastle upon-Tyne Electric Supply Bill before a Committee of the House of Commons, presided over by Colonel Welby, last week, Mr. Clement W. Fairweather, the Joint Engineer with Mr. C. S. Brown, of the Northern Counties Electricity Supply Company, said the Company, who had arranged to take from the promoters a supply of electricity in bulk, had adopted the penny-in-the-slot system in Blyth, and had installed 40 meters in cottages in four months. In Durham and other places, they had put in more than 180 meters this year. They anticipated a large demand, and were making the necessary preparations to meet it, having now 500 meters on order. The consumer received 1-6th of a unit for 1d. This was sufficient to light an 8-candle lamp for 5½ hours. The Company paid the whole cost of the installation. On an average, they received in Blyth £2 12s. per annum from each user of the slot meters. Mr. Pember put it to the witness that if his Company only received £2 12s. a year from each cottage supplied through a slot meter, this kind of business was hardly worth doing. Mr. Fairweather replied that they made ¾d. out of each 6d. taken. This is certainly not a very brilliant return on the outlay.

Caution at Tiverton.

The caution which is being displayed by the Tiverton Town Council in reference to the electric lighting scheme might be imitated with advantage in many of our small towns, and perhaps some large ones. Yesterday week the members again spent a considerable time in the discussion of the question, with the result that they came to the unanimous conclusion that, if electric lighting is adopted, it shall not be at present applied to the lighting of the streets. Alderman Amory, who brought forward this resolution, pointed out that electric lighting would cost at least £1400, compared with £750 the cost of gas lighting. The result of this elimination of so important a source of revenue as the public lighting remains to be seen; but it seems scarcely probable that the Corporation will proceed with an enterprise which, without this support from the rates, is foredoomed to financial failure. In any event, the Washfield Mill water-power scheme, which has been under consideration now for several months, appears to be dead. Alderman Winton, one of the members in favour of electric lighting, admitted that not a single person outside the Council had a good word to say for the scheme; and he suggested, as an alternative, that a small tentative plant be laid down at the gas-works, in order that the Council might retain the Provisional Order. The Council, however, adopted another proposal of Alderman Amory in favour of a canvass of the town within the compulsory area, to ascertain how many householders would



AS SUPPLIED TO SIR THOMAS LIPTON.

"SHAMROCK"

STOVE

FOR

"SHAMROCK DAY."

[The Richmond Gas Stove and Meter Co., Ltd., 65, Grafton Street, Dublin.]

be prepared to adopt electric lighting at the prices suggested by the engineer who advised the Council. By the time they get this report, the Council may not improbably come to the conclusion that the thing is not worth doing. In any case, it is gratifying to find a Corporation proceeding in the matter with a sense of responsibility and regard for the interests of the ratepayers.

The Position at Bath.

The Inquiry Sub-Committee of the Electric Light Committee of the Bath Urban Sanitary Authority have issued a further report, which came before the last-named body on Tuesday. It contained the following recommendations: "(1) That Mr. Manville's scheme of reconstruction be not undertaken at the present time. (2) That immediate steps be taken to obtain the consent of the Local Government Board to carry out the works described in the joint report of Mr. Manville and Mr. Teague, at an estimated cost of £13,371, so as to provide for next winter's load, and to guard against the risk of another breakdown. (3) That meanwhile, in consequence of the applications which have been received, we be authorized to receive detailed tenders for the purchase or hire of the works. (4) That, pending the decision of the Council as to the future of the undertaking, no reduction be made in the number of public arc lamps, but that the charge per lamp be reduced to £24 per annum." The ex-Mayor (Mr. T. B. Sillcock), in moving the adoption of the report, said he was sorry it was only of an interim character. They suggested that definite action on the future of the undertaking should be postponed until they possessed further information. Applications had come from companies and men who were in a position to carry out any undertaking they might enter into, for permission to send in tenders to purchase or lease the works; and, having regard to the fact that many citizens favoured the getting rid of the concern, they thought it would be wise to receive these offers. But if they were inclined to seriously enter into the question of disposing of the works, several months would elapse before a definite decision could be come to, and they were face to face with the fact that they could not enter upon another winter without improving the plant, unless they ran the risk of further breakdowns. The outlay recommended by the Engineers would not be thrown away supposing the Council decided to continue the works and spend more money upon them. There were some gentlemen who said they ought not to spend even this £13,300, but should sell the concern immediately. It was impossible to do this. Mr. Bush seconded the motion. Mr. Isaacs asked why, if the Committee proposed to sell, did they not go boldly and ask for prices. If they spent a reasonable sum on the works, they had in them a perfect little gold mine. He moved, as an amendment, that the clause of the report recommending that the Committee be allowed to receive tenders be referred back until such time as they were in a position to judge the effect upon the undertaking of the expenditure now proposed by Mr. Teague. Mr. Powell seconded the amendment, and condemned the panic in which the Council had acted. The amendment was defeated by 15 votes to 11; and, excluding three members who are shareholders in the Gas Company, it would still have been lost by one vote. The report was adopted.

SUBWAY AND ELECTRIC LIGHTING PROPOSALS FOR LONDON.

The London County Council had what is for them an unprecedented run of good luck in the House of Commons last Friday evening. They actually got a block of three Bills through the second reading; and, in a division on one of them, they swamped the President of the Board of Trade and his following who ran counter to the measure. This is the Bill in which the Council have embodied a proposal for wholesale powers of purchase of the electric lighting concerns in the Metropolis. As they cannot have anything more than a finger in the water-works pie, they are bent upon having a bigger share in the electricity district. With a show of parental solicitude, the Council have, in the foremost part of the Bill, made provision for the local authorities to combine for the purchase of the electric lighting undertakings in their areas. But, succeeding this, they seek an authorization on their own account to purchase the electric undertakings, if the local authorities prefer them to do so. The disinterested promoters also desire power to supply electricity in bulk to the local authorities and others. The feeling of the Government, however, is that if the problem of electric lighting in London requires dealing with, it should be by a Public Bill, and not a Private one. In face of Mr. Gerald Balfour's protest, the County Council, by the aid of 36 London Unionist members, got the Bill over the perilous stage of second reading; but the President of the Board of Trade may have some influence when the Bill reaches the Committee rooms. It looks as though the history of the Metropolitan water question is going to be repeated in another branch of public supply.

One of the other County Council Bills which passed the second reading was the Subways and Tramways Bill; but it went through on the understanding that Part III. would be withdrawn. The primary object of the measure is to authorize the Council to construct a subway and tramway between Theobald's Road and the Victoria Embankment; and, in conjunction with this scheme, they seek power to require gas, water, electric light, and other companies to move into this subway any pipes or wires in any of the thoroughfares affected. For this accommodation, they desire to make charges. But Part III. was of that immoderate character which distinguishes most of the Council's parliamentary ventures of late. They practically wanted by it to make themselves masters of everything under the surface of the roads of the Metropolis. They asked, in their own peculiar airy way, for general powers to make and use subways and tramways in any part of the County of London, and for authority to require the several companies having power to interfere with the streets to move their property into the subways, and to make use of them for future work, with, of course, a right to rent for such use. But this part has gone; and the interest in the Bill is confined to the length of subway first mentioned. If the County Council would limit their parliamentary flights, they would, in the end get on much better and faster. It is their action in appearing session after session with unreasonable proposals that has produced the prejudice against them at Westminster.

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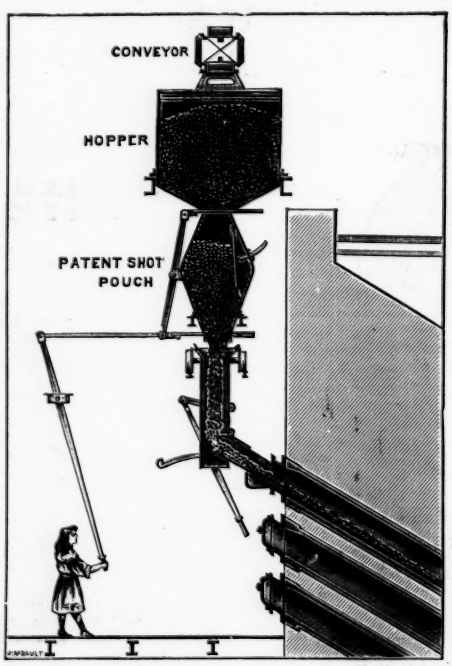

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Another step was taken on Thursday in the slowly-moving process for the transfer to the Corporation of the undertaking of the Coatbridge Gas Company. It was brought up by Mr. O'Neill, who moved that the Corporation promote a Bill, in the ensuing session of Parliament, for the purpose. This means the session of 1903; so that Mr. O'Neill cannot be accused of not giving the Company sufficient warning that he has designs upon them. But, truth to tell, his designs are not of the sinister order with which we are familiar when a stray member of a Town Council gets possessed of the idea that it would pay the community to confiscate the property of the Gas Company. Mr. O'Neill is quite fair in his proposals. He considers that the usefulness of his proposal must be self-evident, and that the Corporation need have no fear of the undertaking paying. While they had a number of things on their hands just now that must necessarily add largely to the burdens of the taxpayer, without much hope of remuneration—such as the fever hospital—and while having perfect confidence in the water-works, the expense of taking them over had been so great that there would be some time needed, as well as difficulty encountered, to turn it into so profitable a thing as they would like to see it. In the matter of the gas-works, they had the undertaking distributed over a compact area and in fairly good working order; and every report went to show that the concern was increasing in value. This, also, he considered, was an opportune time for taking action in the matter; for assuredly the undertaking would grow very rapidly, and if much more time were allowed to pass, a greater amount would have to be paid. The subscribed capital of the Company was shown by the accounts to be £80,000, which seemed to him to be really a modest sum, considering the enormous value of the works to the district. It was perfectly unnecessary to argue as to whether the work might be better performed, or gas be supplied more cheaply, by the Company or by the Corporation. That was totally out of the question. The tendency now was that all undertakings for the supply of gas and water should be in the hands of the municipalities, and, so far as they knew, in no case had the people been disappointed since taking over these concerns. If the Glasgow Corporation had been content fifty years ago to allow the gas and water to be supplied to the citizens by private enterprise, they could easily conceive how enormous would be the work of acquiring such undertakings in that city at the present time. The Glasgow Corporation were judicious in their day in securing possession of those works at the right time, with the enormous advantages they now commanded. He thought that if they deferred the matter much longer in Coatbridge, they would be perpetrating not only an injustice, but an unfairness to the community. Of course, the question of expropriating the proprietors of the Gas Company was a matter which he thought the shareholders of the Company would be able to look upon with very little concern, considering that they would be recouped to the very fullest; and he believed there was hardly one of the shareholders who did not look forward to ultimately selling out to the Corporation. They were in a different position from what they were when they were dealing with the water undertaking, because in this matter they had only one body to deal with, instead of three separate corporate bodies. They had nine months in which to make preparations for approaching Parliament; and he thought that time would be judiciously used if a small Committee of men of influence in the Council were appointed to negotiate with the Gas Company, with a view to avoiding opposition and expense. Bailie M'Queen suggested that a Committee should be appointed to inquire as to the purchase of gas-works by other Corporations in Scotland, so that these might be a guide to them. Mr. O'Neill agreed to Bailie M'Queen's suggestion; and a Committee was appointed to confer with the Gas Company, and endeavour to arrange terms for a transfer.

The trial of the actions relating to the explosion of gas in a Dundee tailors' workroom, of which I have sent you a report (see p. 721), makes melancholy reading indeed. Apart from the fact that two people lost their lives and others were injured, which must excite everyone's sympathy, there is the fact that all this occurred through the fussiness of an old man who thought he could put matters right without waiting for the gasfitter's arrival. That was a fatal mistake for him, and a costly mistake for his employers. Then there is the story of the girls larking and pulling over the standard, and of their saying nothing about it, although smells of gas began to be noticed much more strongly—in fact, it was only two or three days before the trial that this incident leaked out. It was probably the leading factor in the decision of the cases, because it certainly placed the overt act which resulted in the explosion upon the shoulders of the employee class. But more melancholy still is the fact that, while this firm were honourably paying full wages to the injured till such time as they could return to duty, they allowed themselves to be persuaded by a lawyer to bring these actions; and the result now is that they have lost all. The whole affair forms a chain of circumstances so complete that it almost would seem that everything had been arranged so as to lead up to a disaster; and therefore we are not likely to have such another again. But the chain is worth following, as, taken up at any point, there is instruction to be derived from a study of what took place.

The Town Council of Dumfries have not seen their way to adopt in their entirety the recommendations by Mr. G. Malam, their Manager, with reference to extensions at the Corporation gas-works. They wished Mr. Malam to modify his report; but this he was unable to do, on account, as he stated in his letter of reply, of the large increase in the consumption of gas. Since the 15th of May, the increase over the corresponding period of last year has reached the total of 4½ million cubic feet. The Gas Committee recommended that Mr. Malam be asked to prepare a statement of the probable cost of a new gasholder of a capacity of 250,000 cubic feet. Mr. Malam's recommendation was a holder of a capacity of 500,000 cubic feet, which could be enlarged to 750,000 cubic feet. At the meeting of the Town Council, Mr. Thomson stated that he objected very strongly to building the large holder which

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was proposed; and, after corresponding with various gas managers, he found that they would have sufficient storage accommodation with a smaller holder. The largest day consumption was 458,000 cubic feet, and with this new holder they would have accommodation for 500,000 cubic feet. The Council agreed to the suggestion of the Gas Committee. Mr. Thomson is the gentleman who, a month ago, objected to the extension of the gas-works at an expenditure estimated at £15,000, upon the ground that electricity would make a difference upon the demand for gas. It seems that he has been occupying himself since then in writing to gas managers upon the subject of the gasholder accommodation. That is bad enough; but what is to be said of the gas manager who would reply to a letter from a member of a town council seeking for information wherewith to thwart the proposals of the local manager? There are consulting engineers who are prepared to advise corporations, upon payment; but their employment is above-board, and their recommendations are made openly, and are liable to criticism. This surreptitious correspondence of various gas managers with Mr. Thomson is something very different, and must be condemned as unprofessional.

It was reported to the Dumfries Town Council at their meeting last week that the deficit in the gas accounts, due to the delinquency of Jas. Herries, their late Cashier, amounted to £975; that the Council had received £100 from a Guarantee Society, and £187 from Mr. Herries' estate; making a total loss to the Council of £688.

Mr. A. C. Young submitted to a recent meeting of the Works Committee of the Arbroath Town Council a report as to over and under payments in connection with prepayment meters. Prior to the 15th of May last, it had been found that there had been over-payments to the amount of £56. These, it was resolved, should be repaid to the consumers at the first collection. Already payments had been found to be few and trifling; and the Committee resolved to take no action with regard to them. It appeared, however, from the Manager's report, and the explanations given by him, that since the commencement of the current financial year the under-payments have exceeded the over-payments, and that there is a loss to the Corporation upon the gas supplied through prepayment meters. Mr. Young was authorized, as he had suggested, to fix the quantity of gas to be supplied for 1d. at 17 cubic feet, which was at the rate of 4s. 9½d. per 1000 cubic feet. At present, 19 cubic feet are given for 1d. The Gas Committee considered, at their last meeting, Mr. Young's report as to the work he considers to be necessary in the retort-houses, which I gave in my "Notes" in the "JOURNAL" for 4th inst.; and they instructed him to make up and submit alternative estimates of the cost of carrying out his several recommendations.

The smells of gas which have been troubling certain of the lieges in Lanark are likely to be of more than passing moment. The Medical Officer of the borough has ordered the inhabitants of one house to leave; and another householder, an ex-Provost, is threatening to do the same. Another gentleman has invoked the aid of the Local Government Board, who have called upon the Town Council to report as to the smells. The Town Clerks have been instructed to write to the Gas Company to the effect that in future permission must be asked and obtained before the streets are to be opened by the Company's servants, and that all disused pipes must be removed. On the other side, the Secretary of the Gas Company has written to the Town Clerks complaining that a road-roller which was recently used upon the streets had broken a number of the gas-pipes, and that a claim would be made upon the Town Council for the damage which had been done. This communication was the cause of some consternation when it was submitted to the Council on Monday. It was stated that no one had ever heard of any damage having been caused by the road-roller; but the letter was sent to a Committee to consider more fully. In the meantime, on the advice of the Clerk to the meeting, it was resolved to reply to the Gas Company that the Council denied all liability for damage caused by the road-roller. Not a very learned advice, surely.

I stated some weeks ago that the Corporation of Arbroath are seeking the services of an eminent water engineer to advise them as to the augmentation of the water supply to the town. There are members of the Corporation who are loth to go far afield for water. One of these is Treasurer Forbes, who, considering that the German Ocean is close by, has obtained a remit to a Committee to consider whether the Town Council should not introduce a supply of sea water for street watering, flushing of drains, baths, and such like purposes. In this proposal, Mr. Forbes has the support of Sir Henry Littlejohn, of Edinburgh, who wrote to him that he had, in season and out of season, advised his Corporation to introduce salt water, and of the Burgh Surveyor of Yarmouth, who wrote that for all the purposes mentioned, except fire extinguishing, sea water was equal to fresh water, and was much cheaper. As for fire extinguishing, he advised that sea water should not be used, because a house which might be soaked with it would not be fit to live in again.

It is disappointing to have to record that friction has arisen between the Edinburgh and District Water Trust and Mr. John Best, their principal Contractor. Mr. Best is claiming an additional sum for the construction of the puddle trench at the Talla reservoir; and the Trust, being advised by Mr. W. A. Tait, their Engineer, that no more puddle was put in than was specified for, are disputing the claim. There is a misunderstanding also about the work which is being done in the repair of the tunnel which gave way in the course of the winter. Mr. Tait reports that, on cutting out a portion of the lining of the tunnel, he has found that it is two or three inches thinner than it should have been. There has been correspondence between Mr. Tait and Mr. Best upon the subjects of difference; and the situation is not improved by the fact that Mr. Best has consulted a law agent, who has written to the Trust making an innocent request that Mr. Best be furnished with copies of certain documents, and that a meeting be arranged between them at which the law agent would be present. The Trust have resolved not to comply with these requests; and they have also instructed Mr. Tait to have sections of the linings of the tunnels cut out and preserved for evidence. This does not look very much as if circumstances were making for a peaceful solution of differences, but the opposite. It was stated at a meeting of the Trustees which

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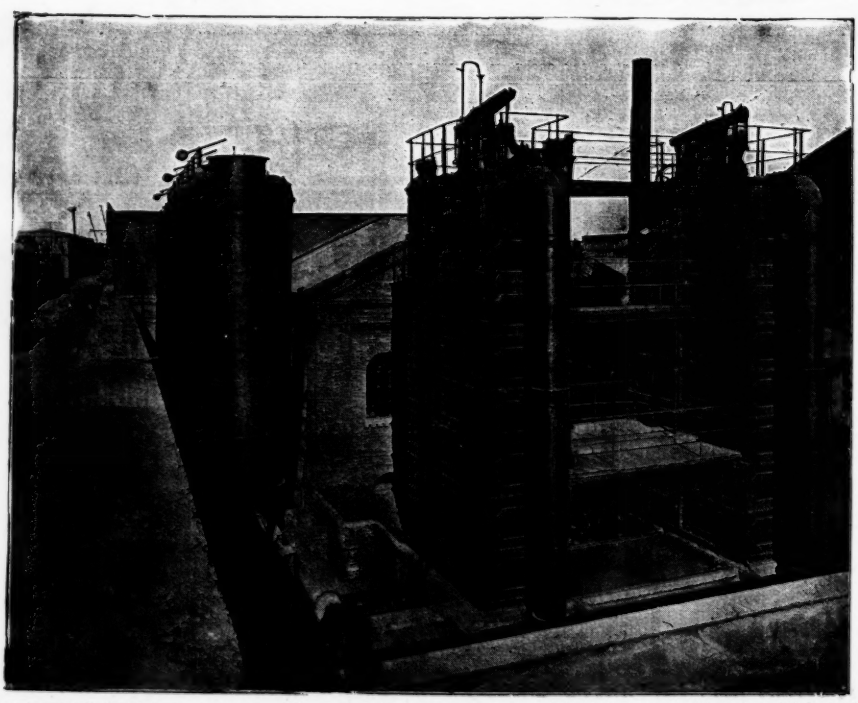

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has been held this week that one of the tunnels has got into such material (nature not explained) that only three yards were driven last month; and that while the contract price is £4 10s. per yard, Mr. Best reports that the construction of the tunnel at that spot is costing him £20 per yard. There are 500 yards of that tunnel to be driven; and the question is whether shafts should not be sunk so as to give a greater number of working faces, and thereby allow the works to be completed at as early a date as possible. At the present rate of progress, about thirteen years would be required for the completion of this tunnel. Mr. Archibald stated at the meeting of the Trustees this week that the water in the reservoirs is 220 million gallons less at present than it was at this date last year. That is about fifteen days' supply less. The situation is getting worse every day, as the rainfall is exceedingly limited.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 15.

Sulphate of Ammonia.

The improved demand at date of last report has been sustained throughout the week, and prices have gradually hardened, the closing quotations being £11 8s. 9d. per ton f.o.b. Hull, and £11 11s. 3d. to £11 12s. 6d. per ton f.o.b. Liverpool and Leith. Early in the week, consumers abroad availed themselves largely of speculative offers at below the equivalents of makers' quotations; and later there has been a considerable amount of direct buying at advanced prices. Meantime, speculators, finding their "bear" offers being closed with, have faced about, and near the close they have been devoting themselves to "covering." Home demand is on a very satisfactory scale, and no doubt the heavy shipments in February have affected the opinion of buyers everywhere. Makers have advanced their ideas for delivery over the summer months; but, though there has been inquiry in this position, buyers have not so far conceded the prices demanded.

Nitrate of Soda.

This is very firm on spot, at 10s. 4½d. to 10s. 6d. per cwt., according to quality, and there is good demand.

LONDON, *March* 15.

Tar Products.

There has not been very much business doing during the past week. Pitch continues to advance in value, and business is reported for forward delivery to a much greater extent than has hitherto been the case. It is stated that sales have actually been made up to the end of March, 1904, and at fairly good prices. The London makers have nothing to offer for this year. In fact, the Gaslight and Coke Company decline to quote for 1903, stating that they have already sold very large quantities over next year. There is a strong demand from the Continent; but as regards South Wales, business is not quite so brisk, doubtless owing to the depression which prevails in the fuel trade. It is difficult to fix the value of this article. Very high prices are undoubtedly being paid for prompt delivery, but transactions are very limited, owing to the scarcity of supplies. The market for benzol is still very dull. There are sellers of 90 per cent. at 9d. in London; but consumers do not seem to care to purchase at this figure, even for forward delivery. 50-90 per cent. is quite neglected. It would be difficult to realize 8d. for the same. In fact, a large parcel was offered at this price, but was declined by consumers. Carbolic is in strong demand, especially for early delivery at 1s. 11½d. This price has already been paid to London makers, who now ask 2s.; and the latter figure is generally demanded by manufacturers for prompt and forward delivery. Crystals remain quiet; but there are a few orders in the market for 34-35's early delivery. Creosote continues dull; and there is not much doing in the article. Prices have rather a downward tendency in both London and the provinces. There is no business to report in anthracene; and it is very difficult to fix the actual value at which sales could be effected.

The average values during the week are: Tar, 16s. to 19s. Pitch, London, 40s. 6d. to 41s.; east coast, 39s. to 39s. 6d.; west coast, 36s. to 37s. Benzol, 90's, 9d.; 50's-90's, 8d. Toluol, 9d. Crude naphtha, 3½d.; solvent naphtha, 10d. to 11d.; heavy naphtha, 9d. to 10d. Creosote, London, 1½d.; North, 1d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 11d. to 1s. 11½d. Naphthalene, 40s. to 50s.; salts, 20s. to 30s. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

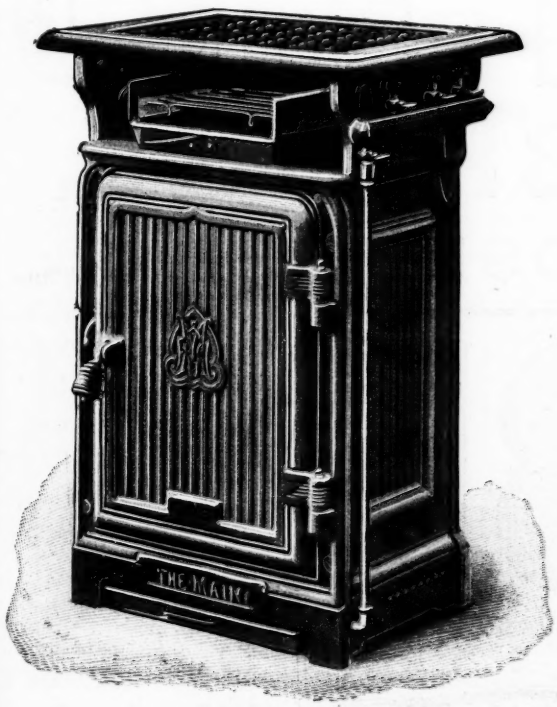
Sulphate of Ammonia.

The market closes very firm indeed with a good demand, especially for prompt delivery. Beckton has been sold for prompt at £11 10s.; and the Gaslight and Coke Company are still sellers at this price. Early in the week, £11 7s. 6d. was accepted for April, and £11 5s. for May; but at present there are no sellers at these prices. As regards Hull, very good prices were paid for prompt delivery; £11 10s. having been freely offered, and in one instance a little more than this was paid for a specially fine make. In Leith, business is very good for prompt delivery, and £11 10s. is stated to have been paid, in more than one instance, for early delivery. As regards Liverpool, there is very little business to advise. Prices do not seem to have risen proportionately with those at other ports. The demand for home consumption is undoubtedly very strong for delivery during March; a decided premium being paid for same.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The continued mildness of the weather and the advance of the season, tend to weaken prices in the open market, where special sales have to be made. Any appreciable giving way is, however, still confined to the inferior classes of fuel; and Lancashire coalowners for the most part are holding steadily to late rates, both for round coal and slack. Pits are also kept on practically full time—that is, about five days per week—and though the output is not moving away quite so freely, there is comparatively very little being put on the ground, and



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stocks remain extremely low. For house-fire descriptions, the demand is moderate, with quoted pit prices remaining at about 15s. to 15s. 6d. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house-coal. The inland demand for steam and forge purposes is maintaining some slight improvement, which is helping to steady prices; and 9s. per ton at the pit remains about an average figure for good steam and forge coal. The shipping demand, however, continues but indifferent; and collieries which have to seek an outlet in this direction are unable to maintain late rates—10s. to 10s. 6d. per ton representing about the quotations for good qualities of steam coal, delivered at the Mersey ports. Engine fuel is becoming rather more plentiful on the market; and no doubt the resort to short time in the cotton mills will tend to throw a good deal of slack on the market. Collieries which have hitherto had no difficulty in disposing of all their output are reporting that engine fuel is beginning to hang; and common sorts are becoming more of a drug, owing to the large supplies offering from outside districts. Prices in Lancashire are not so firm as they have been, but are practically without any really quotable change; medium qualities averaging about 6s. 6d. per ton at the pit, and best descriptions of slack 7s., with common sorts 5s. to 5s. 6d. For coke there is a continued steady demand, with prices well maintained at late rates; best Lancashire foundry cokes being quoted 22s. to 24s. per ton, and best washed furnace cokes 13s. to 14s. In the Yorkshire district, contracts for common unwashed furnace cokes have been recently placed at 11s. per ton at the ovens, with best washed furnace cokes quoted at 13s. to 13s. 6d.

Northern Coal Trade.

There is a duller tone in the trade of this district, especially for fuel for early delivery; there having been a number of contracts for forward delivery placed, which have steadied the prices in that case. Best Northumbrian steam coals are about 10s. 9d. to 10s. 10½d. per ton f.o.b., and second-class steams are weak at from 8s. 9d. to 9s. Steam smalls are quiet at from 4s. 9d. to 5s., with a fair demand. In the gas coal trade, the Rotterdam and other contracts have been settled; and there has been a considerable quantity of gas coals sold for export over the season. It is a little difficult to give the results of these contracts, because the delivered price not only includes freight as of yore, but also the coal-tax. Making the fairest estimate possible under the circumstances, it would seem that the average price left for the coal f.o.b. would be from 8s. 7d. to 9s. per ton; but where very low freights can be obtained, there will be a little more left for the coal. For occasional cargoes, the price of Durham gas coals varies, according to quality, from 8s. 6d. to 9s. 6d. per ton f.o.b. Coke is rather irregular. Export coke is dull at 16s. 9d. to 17s. per ton f.o.b.; and blast-furnace coke is 15s. to 15s. 3d. at the Teesside furnaces. Gas coke is unaltered for shipment; but household gas coke is in places advertised slightly lower this week.

Scotch Coal Trade.

There was a steadier tone in the market last week; the demand having slightly improved. Stocks are, however, too heavy to allow prices to rise much for some time to come, even though the demand should greatly improve. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 9d. to 10s. 6d., and splint 10s. 3d. to 10s. 6d. The shipments for the week amounted to 192,384 tons—an increase of 33,801 tons upon the previous week, and of 34,674 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,624,904 tons—an increase of 154,490 tons upon the same period of last year.

Sale of the Ecclefechan Gas-Works.—The undertaking of the Ecclefechan Gas Company, which was unsuccessfully offered for sale by auction last January (*ante*, p. 230), was put up again last week. Bidding started at £200, and ran up to £225, when the sale was again adjourned. The property was, however, afterwards sold privately for £230 to the present Manager (Mr. T. Gass).

Rotterdam Gas Coal Contracts.—The "Hull News" states that the contracts have now been given for the gas coal for Rotterdam; but there seems doubt on 'Change as to the details. In some quarters it is said that two-thirds of the coals needed are to be drawn from Durham and one-third from Westphalian collieries; but others reverse these proportions. It would appear that the contest has been keen, and the prices are low; and that once more coal business which would have meant shipping activity at the Humber ports has gone elsewhere.

Newport (I.W.) Gas Supply.—In the year ending Dec. 31, there was a satisfactory increase in the sale of gas by the Newport (I.W.) Gas Company; the gas and meter rental, as shown by the accounts presented at the recent annual meeting of the Company, amounting to £8903, against £8213 for the previous year. The total revenue was £11,370, and the expenditure £8386; leaving a balance of £2984. The amount available for distribution was £1529; and the Directors recommended dividends at the rates of 9 and £6 6s. per cent. per annum on the original and new shares respectively, less income-tax. This would absorb £1213, and leave £316 to be carried forward. The Company's Act of last session cost the Company £1445; the opposition of the Corporation thereto having very considerably increased the expense. The report was adopted.

Windsor Royal Gas Company.—At the recent half-yearly meeting of this Company, the Directors reported that the accounts for the six months ending December 31 last showed a saving in the cost of manufacture, an increase in the quantity of gas sold, and a satisfactory balance of profit. They therefore recommended that dividends at the rate of 5 per cent. on the preference, 10 per cent. on the original, and 7 per cent. on the new shares, should be declared. The Chairman (Mr. J. L. Hollis), in moving the adoption of the report, said that the saving effected had been due to the activity of the new Manager (Mr. H. Buckley), under whose supervision important renewal works were being carried out, the completion of which would place the Company in a better position than ever for the manufacture and supply of gas. The price would be reduced 2d. per 1000 cubic feet as from the 31st inst. The report was adopted, and the dividends were declared.

JOSEPH AIRD
GREAT-BRIDGE.
STAFFORDSHIRE.
TUBES
AND FITTINGS
GAS, STEAM, WATER GALVANIZED-TUBES, &c.
LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

Water-Meters at Cleveland (Ohio).—The water-meter contract at Cleveland, Ohio, has recently been authorized by the City Council. This means that some 11,000 house meters will be set during the present year, after which it is thought probable that meters will become so popular as to lead to successive large installations until the present 50,000 unmetered services have all been changed to metered ones.

Forestry on a Reservoir Watershed.—This question is receiving the attention of the Middletown (Conn.) Water Board. The part of the catchment area on which a fair crop of grass can be raised without other work than mowing will be used as hay fields as long as the crops pay for the mowing. Elsewhere trees will be grown. As an experiment, a number of young trees and seedlings have been planted; but the difficulty of procuring them has led to establishing several nurseries, where seeds of the black walnut, hickory, oak, ash, and pines are planted. It is proposed to cover most of the catchment area with these trees, and look after them, so as to derive some return from the timber when it becomes mature.

The London offices of Messrs. W. C. Holmes and Co. have been removed to No. 11, Westminster Chambers, Victoria Street, S.W.

The Mirfield Gas Company have placed an order with Messrs. R. Dempster and Sons, Limited, for two purifiers, 25 feet square, on Green's system.

Reference has already been made to the decision of the Westminster City Council to have at hand a number of oil-lamps, or "flares," for use at certain points in times of fog. We learn that about twenty of them are being stored in the vaults of St. Martin's Church; and each will give a light of 1000 candles. They stand 5 feet above the ground; but, if necessary, they can be raised to 10 or 15 feet. The oil-vessel is about the size of a street dust-bin, and will contain 25 gallons.

The great waste of water that can occur in mains without detection is well shown in the report of the Yonkers (N.Y.) Water Board for last year. The average daily waste in the high-service district was 602,316 gallons—a decrease of 4·2 per cent. over 1900. This is accounted for by the fact that a large leak which had been allowing water to run into a sewer through a blind drain, was discovered and repaired during July, after which time the water pumped at the high-service station decreased by nearly 50 per cent. as compared with the corresponding months of the previous year.

A brilliant feature in connection with an exhibition of gas appliances which was held in the Town Hall, Smethwick, last week, was a display of Sugg's high-pressure gas system. It was the first application of the system for public lighting in the Black Country. The lanterns were fitted with three of Sugg's patent burners, each consuming 10 cubic feet of gas per hour, and they produced an illuminating effect of 1000 candles. Over the stage, inside the hall, were two suspension lamps, each of 1000-candle power, showing the method of lighting public buildings and factories by the system. At either side was a lamp of 300-candle power. There was a large attendance, and general satisfaction was expressed with the brilliancy of the light.

Messrs. F. C. Sugden and Co., of Leeds, have received orders for their shallow regenerator settings from the Cwmbran and Pontnewydd Gas Company, and also from the Brough, Ellerton, and District Gas Company.

The Gaslight and Coke Company have, we are informed, entrusted the demolition of their gasholders and plant at Lupus Street, Pimlico, and Lambeth Walk, to Messrs. George Cohen, Sons, and Co., of Commercial Road, E.

Messrs. Fletcher, Russell, and Co., Limited, have been holding, in the Assembly Rooms at the Conservative Club, Warrington, a successful exhibition of gas cooking-stoves, the capabilities of which were demonstrated by Mrs. Young. The same firm are exhibiting in the Church Institute, Leeds, with this lady's assistance as demonstrator. Mr. J. F. Shepherdson, J.P., Chairman of the Gas Committee of the Driffield District Council, opened an exhibition of gas lighting, heating, and cooking appliances in the Corn Exchange Buildings last Tuesday, in connection with which cookery lectures were delivered. At Colston Hall, Bristol, the above-named firm, in conjunction with John Wright and Eagle Range, Limited, are holding an exhibition under the auspices of the Bristol Gas Company; cooking lectures being delivered by Miss L. E. Silvester.

A meeting was held last Tuesday, at the Victoria Hotel, Manchester, to consider a proposal to form a Company for the establishment of a Mond power-gas undertaking, having its central gas-producing station at Prestolee, Farnworth, from which power gas might be distributed through mains to such works as could be reached by private way-leaves from the principal landowners of the district, without interference with the rights and powers of local authorities—thereby avoiding the necessity of an Act of Parliament. Mr. Thomas Statter, of Whitefield, Agent to Lord Derby, presided; and there was a good attendance. Mr. Sturgeon, Mr. C. V. Clirehugh, and Mr. Alfred Mond gave particulars with regard to the scheme; and Mr. Fawcus, Chairman of the Lancashire Electric Power Company, expressed the willingness of that Company to locate their works alongside the Power-Gas Company's station.

During the late gas exhibition at the Assembly Hall, Darlington, a display of high-pressure incandescent lighting was made by Messrs. James Keith and Blackman Co., Ltd. One of Keith's No. 3 compressors was used, and 42 of Keith's high-pressure burners in various fittings, for the lighting of the hall, gallery, and approaches—the total illuminating power of the installation being 13,000 candles. The Chairman and members of the Corporation Gas Committee, in sending out invitation cards, referred to the system as being "the perfection of artificial lighting on a large scale, and light for light costing less than half the price of the electric arc." In the past week the exhibition has been transferred to the Corn Exchange, Darlington. During the late gas exhibition held in the Drill Hall, Dumfries, great interest was manifested in the brilliancy of the illumination obtained by an installation of the firm's high-pressure lighting. The installation has proved such a success that it has been decided to retain it for the permanent lighting of the hall. The same Company have also in hand the lighting of over twenty large gas exhibitions, which are to be held in various parts of the country.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: Holborn 121.

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O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

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Resists 4500° Fahr. Best for GAS-WORKS.

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Telegraphic Addresses:
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SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

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Telegrams: "LUMINOSITY."

COAL GAS TAR wanted.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

Telegrams: "BALEFIRE LONDON."

BALE & CHURCH, Late of Bale & Co., OXIDE of IRON, METERS, FIRE-CEMENT, PAINT, &c.

5, CROOKED LANE, CANNON STREET,
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SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

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JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers, Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.
MELROSE CYCLE COMPANY, COVENTRY.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PROVINCIAL Gas Companies may profitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.
Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

GENTLEMAN, who is a good ACCOUNTANT and thoroughly understands SECRETARIAL duties and general work of Gas Office, possessing full knowledge of GAS STOVE and FIRE DEPARTMENT, seeks re-engagement.
Address No. 3800, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS MANAGERS.

WANTED, by a steady respectable man, 57 years of age, in robust health and with large experience on Gas-Works, the CHARGE OF STEAM-BOILERS, ENGINE and EXHAUSTER, STATION METER, or as DAY or NIGHT PRESSURE MAN. Can do a little Gas-Fitting in Iron Pipe or Compo., assist at taking the Meter Indices, or in any Capacity on a Gas-Works, where he can make himself useful.
Address No. 3835, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Foreman in Gasholder and Boiler Shop.
CLAYTON, SON, & Co., LIMITED, Hunslet, LEEDS.

WANTED, at once, capable and ex- perienced man as MAIN and SERVICE LAYER. Permanent employment for a suitable Man.
J. CARTER, Gas-Works, LINCOLN.

GAS-FITTER wanted, well-up in Iron and Compo. and Service Laying. Permanency to a good all round man.
State Wage required and previous Employment to No. 3831, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly reliable and experienced GAS-FITTER by a Provincial Gas Company. He must understand the fixing of Cookers, Fires, and Meters.
Apply, by letter, to No. 3833, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., giving Particulars of Wages required and Experience.

WANTED, by a Gas and Water Com- pany in the South of England, good steady MAINLAYER, experienced in Water-Mains and distribution; also in Gas-Mains. Must not be afraid of hard work. Wages 35s. per week. Will be required to start work on April 7.
State, by letter, Age (which must not exceed 40), Experience, and if married, to No. 3834, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., by March 21st, 1902.

COUNTY BOROUGH OF WARRINGTON.

WANTED, by the Gas Committee, an experienced ASSISTANT GAS ENGINEER. Salary £150 per annum.
Applications, accompanied by *copies* of Three recent Testimonials, addressed to the Town Clerk, Warrington, must be sent in not later than Thursday, the 3rd of April, 1902.
Canvassing directly or indirectly will disqualify applicants.
J. LYON WHITTLE,
Town Clerk.
Town Hall, Warrington.

WANTED, by the Sheffield United Gas- light Company, a SUPERINTENDENT OF MAINS. He must have had considerable experience, thoroughly understand the working of Governors, and be able to advise as to the correct sizes of Pipes required to ensure an adequate supply of Gas in all parts of the Company's District.
There are 485 miles of Mains in use at the present time.
Applications, marked "Superintendent of Mains," stating Age, Married or Single, previous Engagements, and Salary required, to be made to the undersigned, by letter only, not later than Friday, April 4, 1902.
Testimonials not to be sent till asked for.
HANBURY THOMAS,
General Manager and Secretary.
Gas Offices, Commercial Street,
Sheffield, March 15, 1902.

STATION GOVERNOR.

WANTED, 6-inch or 8-inch, with Bye- Pass and Valves complete. If second-hand, must be in first-class condition.
State Price to HOLYWOOD GAS COMPANY, LIMITED, Holywood, Co. DOWN.

ON SALE—Two 10-feet Gasholders for testing Meters, with Indicator, strong Cast-Iron Tank, Pillars, Slides, Balance Wheels, and Brass Taps complete.
SAMUEL DODD & SONS, Lyon Works, OLDHAM.

GAS Plant for Sale—63 Mouthpieces (Tangye's), Ascension-Pipes, Dip-Pipes, Mains, Tar-Boxes, Condensers, Exhausters, Pumps, Engines, Scrubber and Washer, Purifiers, Oil, Naphtha, and Pitch Stills, Condensers, and Receiving-Tanks.
Write W. BLACK, Stanrigg, AIRDRIE.

LEIGH CORPORATION GAS-WORKS.

FOR SALE—Four 18 feet square PURIFIERS, complete with 18-inch dry-faced Four-Way Valve and Connections, including lifting tackle.
Further particulars may be obtained from the ENGINEER and MANAGER, Gas-Works, Leigh, LANCS.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

CHESTER UNITED GAS COMPANY.

FOR SALE—40,000 per hour Reciprocat- ing EXHAUSTER and ENGINE by R. Dempster and Sons, in first-class working condition. Discarded to make room for larger one. Can be seen at work by appointment, or photo. sent.
Apply to J. C. BELTON, Engineer, Gas-Works, CHESTER.

MERTHYR TYDFIL GAS COMPANY.

FOR Immediate Disposal, Complete SULPHATE PLANT in First-Class condition. Can be seen at any time by appointment. Extensions the cause of disposal.
Further Particulars from the Manager.
Gas-Works, Merthyr Tydfil,
March 4, 1902.

OWING to the death of late Owner, the Gas-Works complete, together with valuable franchise in one of the best business Towns in the State of Florida, U.S.A., are FOR SALE.
These Works have increased in output for the past Ten Years, and the Year ending Feb. 1, 1902, is the largest in its history. The net profit this Year is £800; and the Works can be had for £4500.
Full Particulars from J. B. CHASSEAUD AND CO., 6 and 8, EASTCHEAP, E.C.

TO BE SOLD—
GASHOLDER, Two-Lift 45 ft. by 14 ft. = 42,000 cubic feet capacity.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

GAS FACTORY, ROYAL ARSENAL, WOOLWICH.

THE following plant is offered for Sale—
Five 12 feet square Cast-Iron GAS-PURIFIER BOXES and Wrought-Iron COVERS.
14 10-inch RACK and PINION VALVES.
Two CRANES, hand-lifting, for above covers.
The Purifiers, &c., must be disconnected and removed at the purchaser's expense, but the earthwork will be cleared by the War Department.
Further particulars can be obtained on application at the Building Works' Office, Royal Arsenal, Woolwich.
M. T. SALE, Colonel (Ret.),
Supt. Building Works.
Royal Arsenal,
Feb. 27, 1902.

TUAM GAS-WORKS.

TENDERS are invited for the Con- struction and Erection of a new GASHOLDER of Steel, 40 ft. diameter by 12 ft. deep, and the building of a CONCRETE TANK for same.
Tenders, accompanied by complete Specifications and Drawings, by March 25, to the undersigned, from whom any Particulars required may be obtained.
FRANK BROWNE,
Manager.
Gas-Works, Tuam,
Co. Galway, March 4, 1902.

THE Urban District Council of Hindley are prepared to receive TENDERS for Two SHALLOW GENERATOR GAS-RETORT SETTINGS and CONNECTIONS complete, and fixed in the existing Arches at the Gas-Works, Hindley.
For further Particulars, apply to Mr. Dickinson, Manager, Gas-Works, Hindley.
Sealed Tenders, endorsed "Retort-Settings," to be sent to the undersigned, not later than Monday, March 24, 1902.
The Council do not bind themselves to accept the lowest or any Tender, and persons tendering must do so at their own Cost.
By order,
STEPHEN HOLT,
Clerk to the Council.
Council Offices, Hindley,
March 18, 1902.

RETORTS AND RETORT MATERIALS.

THE Lurgan Gas Company invite PROPOSALS for the supply of RETORTS, 9 ft. 5 in. over all, by 26 in. by 15 in. inside, and for RETORT MATERIALS delivered at the Works, LURGAN.

TENDERS FOR TAR.

THE Directors of the Exeter Gaslight and Coke Company invite TENDERS for their surplus TAR for Twelve Months from the 25th of March next, at per ton delivered into Contractor's tanks at the Company's Works.
Sealed Tenders, endorsed "Tenders for Tar," will be received by the undersigned on or before Saturday, the 22nd of March next; but the Directors do not bind themselves to accept the highest or any Tender.
By order,
W. A. PADFIELD,
Engineer and Secretary.

SKIPTON URBAN DISTRICT COUNCIL.
(GAS-WORKS.)

CONTRACT FOR IRON PIPES.

THE Council invite Tenders for the supply and delivery free at Skipton of about 350 yards of 12-inch and 630 yards of 9-inch CAST-IRON SOCKET GAS-MAINS.
Specification and Form of Tender may be obtained on application to Mr. J. H. Woodward, Manager, Gas-Works, Skipton; and Sealed Tenders, endorsed "Gas-Mains," are to be delivered to him not later than Five p.m., on Monday, March 24.
The lowest or any Tender not necessarily accepted.
RICHARD WILSON,
Clerk to the Council.

MANCHESTER CORPORATION GAS-WORKS.
DROYLSDEN STATION.

TENDERS FOR COAL AND CANNEL NUTS.

THE Gas Committee are prepared to re- ceive, on or before Thursday, the 3rd of April, OFFERS to supply 5000 Tons of CANNEL NUTS, and 4000 Tons of COAL suitable for Gas Making for delivery (by boat preferred) at their Droylsden Gas Station during a period of One Year commencing from the 1st of May, 1902.
Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
March 14, 1902.

CITY OF LEEDS.
(GAS DEPARTMENT.)

THE Gas Committee of the Leeds Cor- poration are prepared to receive TENDERS for the supply and erection of an 18-inch STEEL MAIN over South Accommodation Road Bridge.
Plan may be seen, and Specification and Bill of Quantities obtained, on application to the undersigned.
Tenders, endorsed "Steel Main," addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, must be delivered on or before Tuesday, the 25th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings, Leeds,
March 14, 1902.

LEEDS CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Leeds are prepared to receive TENDERS for the supply of about 6000 Tons of GAS OIL, for the manufacture of Carburetted Water Gas, delivered free by rail in Tank-Waggons to the Gas-Works Sidings, Hunslet Lane, Leeds, during the Two Years ending the 30th of September, 1904.
Specification and Conditions of Tender can be obtained on application to the undersigned.
Tenders and Samples, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, and endorsed "Tender for Gas Oil," must be delivered on or before Tuesday, the 25th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Municipal Buildings,
Leeds, March 8, 1902.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to re- ceive TENDERS for the supply of LIME, ACID, FIRE-BRICKS, WROUGHT-IRON TUBES, GAS, WATER, and GUN METAL FITTINGS, OILS and PAINT, IRONMONGERY, LEAD PIPE, BOOKS, STATIONERY, &c., as may be required for the Half Year ending the 30th of September, 1902.
Further Particulars and Forms of Tender may be obtained on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R.S.O. Glam.
No Form of Tender other than issued by the Council will be accepted.
The Contractors will be required to pay the Standard Rate of Wages recognized in the district.
Tenders, endorsed "Contract No. 1, 2, &c.," as the case may be, addressed to the Chairman of the Gas and Water Committee, to be sent to the undersigned on or before Ten a.m. on Thursday, the 27th inst.
The Council do not bind themselves to accept the lowest or any Tender.
WALTER P. NICHOLAS,
Clerk.
Council Offices, Pentre, R.S.O. Glam.,
March 12, 1902.